VOLUME 50, NUMBER 3 March 1958

JOURNAL OF Home Economics

RESEARCH ISSUE

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Here's a suggestion that'll save time and add appeal to your meal. Use bite-size Rice Chex and Wheat Chex instead of toast for creamed eggs, creamed chicken and Welsh rarebits. And try Rice Chex instead of fried noodles for chow mein. Chex stay crispy and crunchy the whole meal through.
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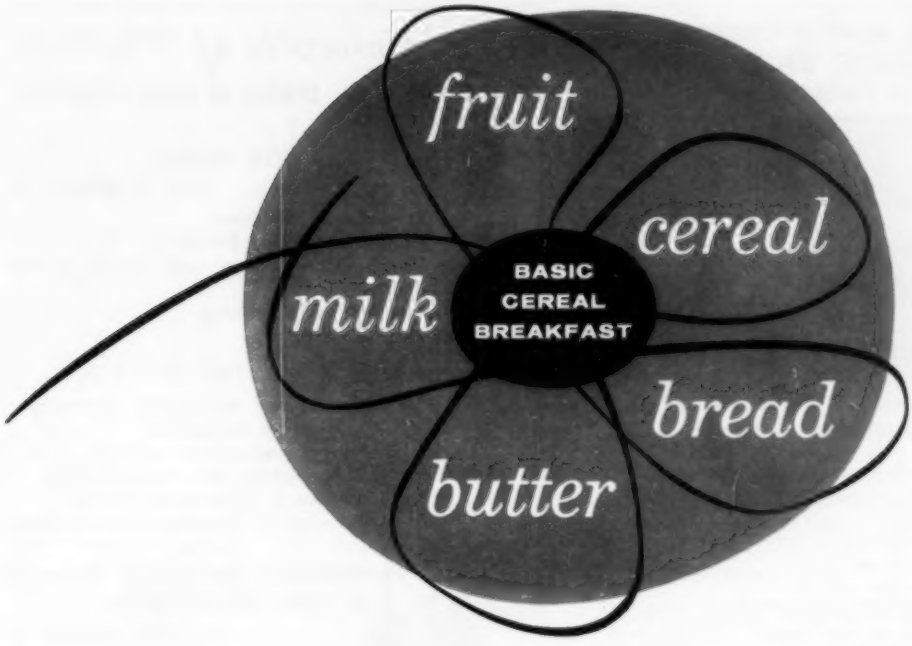

are you interested in a *low-fat* quick and lasting energy breakfast?

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The Iowa Breakfast Blood Sugar Studies proved that a basic cereal and milk breakfast providing about 20 gm. mixed plant and animal protein (cereal and milk) provided quick and lasting energy throughout the early and late morning hours. As shown in the table below this morning meal is *low in fat* and provides well-balanced nourishment.

basic cereal low-fat breakfast pattern

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Cereal, dry weight, 1 oz.,
with whole milk, ½ cup, and sugar, 1 tsp.,
Bread, white, 2 slices, with butter, 1 tsp.,
Milk, nonfat (skim), 1 cup,
black coffee

Nutritive value of basic cereal breakfast pattern

CALORIES	502	VITAMIN A	600 I.U.
PROTEIN	20.5 gm.	THIAMINE	0.46 mg.
FAT	11.6 gm.	RIBOFLAVIN	0.80 mg.
CARBOHYDRATE	80.7 gm.	NIACIN	3.0 mg.
CALCIUM	0.532 gm.	ASCORBIC ACID	65.5 mg.
IRON	2.7 mg.	CHOLESTEROL	32.9 mg.

Note: To further reduce fat and cholesterol use skim milk on cereal which reduces Fat Total to 7.0 gm. and Cholesterol Total to 16.8 mg. Preserves or honey as spread further reduces Fat and Cholesterol.

Bowes, A. deP., and Church, C. F.: Food Values of Portions Commonly Used. 8th ed. Philadelphia: A. deP. Bowes, 1956.
Cereal Institute, Inc.: The Nutritional Contribution of Breakfast Cereals. Chicago: Cereal Institute, Inc., 1956.
Hayes, O. B., and Rose, G. K.: Supplementary Food Composition Table. J. Am. Dietet. A. 33:26, 1957.
Cereal Institute, Inc.: A Summary of the Iowa Breakfast Studies. Chicago: Cereal Institute, Inc., 1957.

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OFFICIAL ORGAN OF THE AMERICAN HOME ECONOMICS ASSOCIATION

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RESEARCH ISSUE

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Notice of change in address should be received six weeks before the date of issue on which the change is to take effect. Both the *old address* and the *new address* should be given.

General Mills proudly presents

The New Betty Crocker Cream Puff Mix

The new Betty Crocker Cream Puff Mix is truly unique, because it contains ingredients most homemakers do not have in their kitchens. It marks a *new* method for making cream puffs at home.

Reasons for a Cream Puff Mix

Text books have long listed cream puffs as "the most unpredictable of baked goods to make", calling them the "hallmark" of the master baker. Consumer tests conducted by General Mills showed that 96 percent had eaten cream puffs, yet 80 percent buy, rather than make them for home use.

Cooking of the paste is the difficult job. Incorrect cooking makes cream puffs that do not puff, or have no bottoms. If cooked correctly, the paste must go through three changes:

1. The starch in the flour must be gelatinized.
2. The enzymes in the flour must be destroyed.
3. There must be a partial emulsification of the paste.

Why the new mix is unique

After several years of testing, the General Mills Research Department solved the problem of destroying the flour enzymes by substituting a special blend of processed starches for the flour.

These starches contained pre-gelatinized starch, thus eliminating the need for cooking the paste. Since there are no enzymes in starch, there are none to be destroyed. The gelatinized starch helps control the viscosity of the paste which aids the proper dispersion or emulsification of the shortening.

It is not expensive

Cream puffs made from Betty Crocker Cream Puff Mix cost less to make than to buy ready-made. And they are actually less expensive than puffs made "from scratch," following a standard recipe calling for butter.

Like all Betty Crocker mixes, this mix meets the exacting General Mills standards. Thorough testing and retesting proved that this unique product fulfills a need for the homemaker. We have built in the following features:

1. Convenience
2. A standard, guaranteed perfect cream puff
3. A saving of time
4. A saving of money

The pictures at the right tell this whole new story.

General Mills

1. *The first testing step* in the General Mills Research Department was making cream puffs "from scratch" to see what caused failure. Later testing resulted in substituting a blend of processed starches for the wheat flour.

4. *Step two: Stir in eggs* one at a time and mix until blended. For one stick, add two eggs; for both sticks, add four eggs. Do not use an electric mixer for the blending, but stir ingredients together by hand.

7. *Miniature puffs* make attractive bite-sized appetizers for before-dinner nibbling. Make them tiny (you can make about 40 puffs per stick) and fill with canapé spread or chicken or seafood salad, as desired.

2. *A special "unitized package"* contains two sticks of Cream Puff Mix. One stick makes six large puffs, two sticks make 12 to 14 large puffs. This gives the homemaker a choice in the number of puffs she wants to make.

3. *Step one in the easiest way to make cream puffs:* Heat the bowl by rinsing with hot water and crumble sticks of mix into bowl. Add ½ cup boiling water for one stick, one cup for both sticks, and stir until blended.

5. *Step three: Spoon the batter* onto ungreased baking sheet, forming mounds about three inches apart. During baking, puffs will triple in size. For miniature puffs, use one teaspoonful of dough, spacing about two inches apart.

6. *Step four: Bake in a hot oven* (425°) for about 30 to 35 minutes, until puffs are a golden brown. And see? Perfect cream puffs, with no chance of failure. Just before serving, cut off tops, fill with a favorite filling, and replace tops.

8. Large puffs can be used as the basis for a variety of main dish or luncheon treats. Fill with chicken a la king, creamed tuna, or ham salad for an elegant and filling dish for family or guests.

9. *Cream puffs or éclairs can be* filled with ice cream, custard, pudding or flavored whipped cream. Top them with confectioners' sugar, chocolate or butterscotch sauce, or sweetened berries.

Washington News

● **AHEA's executive committee** held its usual midwinter meeting at the headquarters building in Washington January 24 to 26. The crowded three-day agenda included usual business items and many questions of much more than routine interest and importance. For example,

What image of home economics does the public hold? Is this the image that we would like it to be? What can be done to increase the numbers of young women majoring in home economics in colleges? These and related questions together with action recommendations from the AHEA public relations committee resulted in a decision to investigate costs and possibilities of a broad public relations program for home economics.

How can we most appropriately observe the Fiftieth Anniversary of the founding of the American Home Economics Association was another question and one which resulted in a decision to ask a committee to begin now to draw up plans for nationwide anniversary activities in 1959.

In view of the tremendous changes—both gradual and sudden—which have occurred in our patterns of living and in our outlook on science and education during the past fifty years—and even during the past year—what are the Association's responsibilities for leadership in home economics? This was another high-priority question on the executive committee agenda.

One answer came from the AHEA committee on philosophy and objectives of home economics which announced that its two years' work will be ready for reporting at the annual meeting in June. Another answer came from President-elect Olga Brucher, whose suggested program of work for the Association for the next two years takes note of the immediate changes as well as our long-time objectives. Another answer came from the program-planning committee for the annual meeting, whose chairman, Irene McDermott, proposed that the topic for the open general session in Philadelphia be shifted to one that would take up the challenge facing education today.

Coming back from the space age to international relations and the one-world concept—which still need our efforts and interest—the executive group reviewed plans for the Ninth International Congress on Home Economics to be held at the University of Maryland July 28 to August 2, 1958. Simultaneous interpretation of the plenary sessions of the Congress (and the considerable cost involved) were approved. The facilities being considered will include interpretation transmitted electronically over different wave lengths for French, German, and Spanish. Congress participants who do not understand English will be provided with portable receivers which can be tuned to the wave length on which the desired language is being transmitted. [For more details about plans for the Congress, see page 221.]

The executive committee also reviewed the proposals for changes in the organizational structure of the representative body of the Association which are to be voted on at the 1958 annual meeting as well as a few other suggestions pertaining to the constitution. Proposed changes for the constitution and bylaws will be published in the May JOURNAL for consideration of members before the annual business meeting.

Cleveland, Ohio, was approved as the location for the 1961 annual meeting.

● **Fact Sheets on Education** issued by the Department of Health, Education, and Welfare in late January and early February included statements by Secretary Folsom emphasizing these topics:

Weakness of United States in foreign language abilities

Growing shortage of adequately trained colleges and university teachers which "represents one of the most serious single problems confronting American education today"

Need for increased and improved collection of information about education

Need for greater effort to encourage fuller development of the talents of our young people

Study of science and mathematics as essential to the national security of our times

The Fact Sheets state the problem in each area and outline the Administration's proposals to meet the need.

AMERICAN HOME ECONOMICS ASSOCIATION
Forty-ninth Annual Meeting, Philadelphia, Pennsylvania, June 24 to 27, 1958
Headquarters: Philadelphia Convention Hall

VOLUME 50, NUMBER 3, MARCH 1958

JOURNAL OF Home Economics

Nutritionists, food researchers, and homemakers will welcome this addition to our knowledge of the effects of certain preparation and handling processes on the nutritive values of foods.

Effect of Holding and Reheating on the Ascorbic Acid Content of Cooked Vegetables

Virginia R. Charles and Frances O. Van Duyne

Dr. Van Duyne is professor of foods in the department of home economics at the University of Illinois. At the time this study was done, Miss Charles was a research associate in foods at the University of Illinois. At present, she is a member of the staff of the College of Home Economics at Michigan State University.

THIS study was undertaken to obtain further information on the effects of refrigerator storage and of reheating on the ascorbic acid contents of cooked vegetables. In a number of publications, vitamin retentions in vegetables prepared by institutional food service methods and held heated prior to serving have been reported. Crosby *et al.* (*1*) reviewed these and presented additional data showing that considerable losses of vitamin C may be expected to occur when vegetables are held heated. Less information is available on the effects of holding cooked vegetables in a refrigerator and of subsequent reheating on ascorbic acid. If significant amounts of the vitamin are lost during refrigeration and reheating, this should be known for accurate appraisal of ascorbic acid content of diets. The work reported here was planned to determine the amounts of ascorbic acid retained in vegetables cooked by home methods when they were reheated after one day of refrigeration or when they were held one, two, and three days in the refrigerator. In addition, the stability of ascorbic acid in the cooking liquids was investigated.

Procedures

Four of the vegetables used in this study were grown under the supervision of the department of horticulture and were prepared on the days they were harvested. These vegetables were Italian Green Sprouting broccoli, Early Dwarf peas, Bloomsdale Savoy Long Standing spinach, Topcrop snap beans used in the first series of experiments, and Improved Commodore snap beans used in the second. Asparagus, Brussels sprouts, cabbage, and cauliflower were obtained from a local retail store on the days preceding experimental work. After preliminary preparation of the vegetables, four or five portions as nearly similar as possible were weighed out, one to be used for determinations of moisture and ascorbic acid contents of the raw vegetables, the other portions to be cooked. For each variation in procedure, replicate lots were cooked on four days and the order of preparation was rotated each day.

Cooking of these vegetables was carried out by boiling 300- or 400-gram portions in one-half their weight of tap water in tightly covered saucepans until tender "done" products were obtained. Details of the preliminary treatment and of the cooking of the vegetables are given in a previous publication (*2*) for 7 of the 8 vegetables prepared, with the exception that Improved Commodore snap beans were cooked 12 instead of 15 minutes. Spinach was washed, carefully sorted, and the tough portions of the stems were cut off. No water was used for cooking except that remaining on the leaves after washing and draining. Four-hundred-gram lots of spinach, with 1.5 grams of salt added, were cooked in a tightly covered four-quart aluminum saucepan for seven minutes. The gas burner was turned on high heat the first five minutes and on medium the remaining two minutes. Immediately after cooking the vegetables were drained in a colander—shredded cabbage for two minutes,

spinach three minutes, and the others one minute. The drained vegetables were weighed and sampled for ascorbic acid determinations.

The cooked vegetables which were to be held in the refrigerator were prepared, drained, and weighed as described above, placed in bowls, and cooled one hour at room temperature. The vegetables and respective cooking liquids were covered and placed in the refrigerator. During the course of the studies the refrigerator temperature ranged from 4° C to 9° C (39° F to 48° F). Products were removed 24, 48, or 72 hours after cooking and reweighed before samples were taken for analysis.

In the first series of experiments, vegetables held 24 hours after cooking were reheated in covered beakers containing 100 grams of boiling tap water. When boiling resumed after the addition of the vegetables, the flame was reduced and the vegetables were boiled one minute, then drained and weighed as before. Cooking liquids refrigerated for 24 hours were brought to a boil in a beaker and boiled over a moderately low flame for one minute. Ascorbic acid analyses were made on the drained reheated vegetables and on the cooking liquids.

For ascorbic acid determinations, samples of the raw and cooked vegetables were blended in an electric food blender with 3 per cent metaphosphoric acid. Cooking liquids were cooled to room temperature, the volumes recorded, and dilutions made. Reduced ascorbic acid contents of the vegetables and of the cooking liquids were analyzed by a modification of the method of Loeffler and Ponting (*3*). Per cent retentions were calculated on the basis of the ascorbic acid contents of the raw fresh products and the total amounts remaining in the drained vegetables and in the cooking liquids. Statistical comparisons of per cent retentions were made by calculating Student's "t" for paired data and testing for significance of differences between means (*4*).

Results

Mean values and standard deviations of the means for the ascorbic acid contents of raw vegetables and of corresponding lots of cooked, held, and reheated vegetables are given in table 1. Total percentage retentions based on original raw weights are included. Since mean figures for the amounts of ascorbic acid in the majority of samples of raw vegetables and in those cooked in a tightly covered saucepan were discussed earlier (*2*), they are repeated here only to characterize the samples and to make evident the changes which took place on holding and reheating.

In seven of the nine products the concentration of ascorbic acid was considerably reduced by holding freshly cooked vegetables in the refrigerator for one day. Statistical analysis of the data showed that losses were highly significant when Brussels sprouts, shredded and sliced cabbage, cauliflower, and peas were held and significant at the 5 per cent level when cooked broccoli and snap beans were similarly treated. Mean amounts retained in seven of the products were from 17 per cent to 42 per cent lower than amounts retained in freshly cooked products. It is interesting that neither asparagus nor spinach lost significant amounts of ascorbic acid during one day of refrigeration.

TABLE 1

Effect of holding and reheating cooked vegetables on ascorbic acid content

VEGETABLE	RAW		COOKED					
			Fresh		Held 1 Day		Held 1 Day and Reheated	
	Moisture Content*	Ascorbic Acid Content*	Ascorbic acid as determined*	Retention (raw weight basis)	Ascorbic acid as determined*	Retention (raw weight basis)	Ascorbic acid as determined*	Retention (raw weight basis)
	per cent	*milligrams per gram*	*milligrams per gram*	*per cent*	*milligrams per gram*	*per cent*	*milligrams per gram*	*per cent*
Asparagus	93.8 ± 0.11	0.17 ± 0.023	0.16 ± 0.015	86	0.16 ± 0.016	82	0.13 ± 0.017	66‡
Broccoli	89.6 ± 0.09	1.06 ± 0.030	1.03 ± 0.072	88	0.85 ± 0.067	68†	0.70 ± 0.040	60†
Brussels sprouts	86.4 ± 0.25	1.26 ± 0.046	1.07 ± 0.015	87	0.82 ± 0.017	63‡	0.72 ± 0.025	60‡
Cabbage, shredded	93.3 ± 0.13	0.52 ± 0.048	0.44 ± 0.038	73	0.28 ± 0.017	44‡	0.21 ± 0.009	33‡
Cabbage, sliced	89.5 ± 0.26	0.63 ± 0.036	0.52 ± 0.020	79	0.41 ± 0.008	59‡	0.35 ± 0.028	53‡
Cauliflower	91.5 ± 0.18	0.94 ± 0.028	0.82 ± 0.019	85	0.70 ± 0.031	68‡	0.62 ± 0.032	64‡
Peas	81.1 ± 0.28	0.31 ± 0.003	0.31 ± 0.009	88	0.20 ± 0.019	52‡	0.16 ± 0.008	43‡
Snap beans	91.4 ± 0.48	0.20 ± 0.014	0.19 ± 0.023	83	0.09 ± 0.021	41†	0.06 ± 0.011	29‡
Spinach	93.7 ± 0.15	0.40 ± 0.034	0.36 ± 0.064	52	0.34 ± 0.043	48	0.25 ± 0.057	32†

* Mean values of four replications and standard deviations of the means.
† Significantly lower mean at the 5 per cent level than corresponding mean for freshly cooked sample.
‡ Significantly lower mean at the 1 per cent level than corresponding mean for freshly cooked sample.

However, after reheating, all products retained significantly smaller amounts of ascorbic acid than did the freshly cooked ones. Decreases in percentage retentions of ascorbic acid between the freshly cooked and the held and reheated ranged from 20 per cent for asparagus and spinach to 54 per cent for snap beans.

Van Duyne, Chase, and Simpson (5) found that when cooked sliced cabbage was held in a refrigerator for one and three days and then reheated there were losses of approximately 28 per cent and 33 per cent, respectively, of the original ascorbic acid. In another investigation Van Duyne, Chase, Fanska, and Simpson (6) reported that spinach retained 58 per cent of the original ascorbic acid content after being cooked in water clinging to the leaves, 52 per cent after cooking and holding 23 hours in the refrigerator, and 33 per cent after cooking, holding, and reheating. Similar results were obtained in the present study. Hollyman, Brodie, and Willard (7) observed that cabbage and spinach reheated for 15 minutes after 24 hours of refrigeration lost 43 per cent to 95 per cent, with an average of 57 per cent, of the ascorbic acid present in the cooked vegetable.

Significant amounts of the ascorbic acid lost in cooking vegetables are usually accounted for in the cooking liquids drained from the products. In this study liquids from the freshly cooked vegetables contained 5 per cent to 18 per cent of amounts present in the raw samples, and the amounts were not significantly decreased by holding in the refrigerator for one day. Mean decreases in the percentages of ascorbic acid in the refrigerated liquids from seven of the products were no more than 1 per cent. Furthermore, losses occurring when samples of held cooking liquids were reheated and boiled for one minute were negligible. These still retained 4 per cent to 13 per cent of the amounts present in the raw samples. When vegetables were reheated, small amounts of ascorbic acid were found in the liquids. These mean percentages ranged from 2 per cent to 8 per cent of the original amounts of ascorbic acid in the samples of raw vegetables.

In the second series of experiments the effect of longer holding periods on the retention of ascorbic acid was investigated. Mean values are given in table 2 for the ascorbic acid contents of five freshly cooked vegetables and of corresponding cooked lots held for one, two, and three days in the refrigerator. Percentage losses in three of the vegetables —broccoli, peas, and snap beans—were significant at the 1 per cent level when these products were held one day. Decreases in amounts retained in the same three vegetables between the first and second day of refrigeration were also highly significant. Cooked broccoli, peas, snap beans, and spinach held three days retained only 45 per cent, 29 per cent, 28 per cent, and 47 per cent, respectively, of the amounts originally present in the raw vegetables. The mean retentions in asparagus were 86 per cent after one day and 77 per cent after three days of refrigerator storage. Decreases were not significant during any one day of holding. It would be interesting to know why ascorbic acid is relatively stable in cooked asparagus, moderate losses occur in spinach, and other vegetables lose considerable amounts during refrigeration of the cooked products.

Gould, Tressler, and King (8) report data indicating that even though cooked cabbage is placed

TABLE 2

Effect of cooking vegetables and of holding cooked vegetables 1 to 3 days on ascorbic acid content

VEGETABLE	RAW		COOKED							
			Freshly Prepared		Held 1 Day		Held 2 Days		Held 3 Days	
	Moisture Content*	Ascorbic Acid Content*	Ascorbic acid as determined*	Retention (raw weight basis)	Ascorbic acid as determined*	Retention (raw weight basis)	Ascorbic acid as determined*	Retention (raw weight basis)	Ascorbic acid as determined*	Retention (raw weight basis)
	per cent	*milligrams per gram*	*milligrams per gram*	*per cent*	*milligrams per gram*	*per cent*	*milligrams per gram*	*per cent*	*milligrams per gram*	*per cent*
Asparagus	92.3±0.34	0.23±0.031	0.22±0.029	87	0.24±0.032	86	0.22±0.030	80	0.22±0.031	77
Broccoli	91.0±0.12	0.92±0.027	0.80±0.030	81	0.66±0.039	62‡	0.52±0.024	50‡	0.48±0.034	45†
Peas	79.1±0.62	0.29±0.021	0.27±0.009	82	0.18±0.005	51‡	0.13±0.009	37‡	0.10±0.018	29
Snap beans	90.9±0.12	0.26±0.009	0.25±0.005	88	0.14±0.006	47‡	0.10±0.010	35‡	0.08±0.009	28†
Spinach	93.6±0.08	0.52±0.030	0.37±0.036	65	0.47±0.031	53†	0.47±0.026	51	0.42±0.025	47†

* Mean values of four replications and standard deviations of the means.
† Significantly lower mean at the 5 per cent level than corresponding mean for the previous day.
‡ Significantly lower mean at the 1 per cent level than corresponding mean for the previous day.

in a very cold refrigerator it slowly loses ascorbic acid and at the end of two days' storage only approximately one-half of its vitamin C content remains. Barnes, Tressler, and Fenton (*9*) found that stored cooked quick-frozen broccoli lost vitamin C on standing in a refrigerator. They noted losses of 19 per cent after 24 hours and 34 per cent after 48 hours of refrigeration.

In the second series of experiments, mean retentions of ascorbic acid in the cooking liquids of freshly prepared products were as follows: asparagus, 7 per cent; broccoli, 12 per cent; peas, 14 per cent; snap beans, 9 per cent; and spinach 15 per cent of the amounts in the original raw lots. Only slight decreases occurred during 1, 2, and 3 days of refrigerator storage. Amounts of ascorbic acid found in cooking liquids of asparagus, broccoli, peas, snap beans, and spinach held in the refrigerator 3 days were 6 per cent, 9 per cent, 9 per cent, 4 per cent, and 14 per cent, respectively.

Summary

Cooked broccoli, Brussels sprouts, shredded cabbage, sliced cabbage, cauliflower, peas, and snap beans lost significant amounts of ascorbic acid during one day of refrigerator storage. Cooked asparagus did not lose significant amounts, and the results obtained with spinach differed in the first and second series of experiments. All of the reheated products, stored for one day in the refrigerator prior to reheating, retained significantly less ascorbic acid than did the freshly cooked products. Ascorbic acid in the cooking liquids was stable during holding and reheating. Extending the refrigerator storage period to three days resulted in greater losses of ascorbic acid from cooked asparagus, broccoli, peas, snap beans, and spinach, and the majority of the day-to-day losses were significant except in the case of asparagus.

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Food Misinformation

What can *you* do about food misinformation? A committee of the American Dietetic Association has investigated the problem and made certain recommendations. Its suggestions are good ones for all of us; for example,

a. Be a watchdog for food misinformation in your local newspapers and on radio and television programs.

b. Take advantage of opportunities to speak to clubs and other groups, assist in preparation of materials, or provide information about other sources of speakers or materials.

c. Participate in program planning for other groups of which you are a member so that there will be guidance in the right direction when programs are planned on foods and nutrition.

d. Be sure any information you provide is up to date and scientifically accurate and that it can be documented by some authentic source.

This paper will be of value to those concerned with the production of food crops as well as to nutritionists and extension service workers concerned with nutritive values of foods and with some of the influences which affect variations in these nutritive values. The fact that this study concerns ascorbic acid content in one of the richest food sources of this vitamin adds to its importance.

Ascorbic Acid in Leaf Blades of Field-grown Turnip Greens in Relation to Concurrent Solar Radiation and Air Temperature[1]

Jessie Whitacre, W. H. Brittingham, and Ethel T. Grimes

Dr. Whitacre joined the staff of the Texas Agricultural Experiment Station in 1926 to start the home economics research program. She was head of that work until May 1954 and a professor in the department until her retirement on January 1, 1958. Dr. Brittingham, now director of the Virginia Truck Experiment Station, was formerly a professor in the department of horticulture at the Texas Agricultural Experiment Station. Miss Grimes was technician in the home economics department at the Texas Station.

A FEW studies under wholly or partially controlled conditions (*1, 2, 3, 4, 5*) have shown, with one exception (*6*), that light and temperature exert a marked influence on the content of ascorbic acid in plants. However, no reports were found in the literature where changes in ascorbic acid were studied when solar radiation and air temperature were recorded continuously. These environmental factors were recorded in Texas' contributing project to a southern regional study on the influence of environment on the chemical composition of plants. Therefore, the information available from the Texas study afforded an opportunity to correlate daily changes in ascorbic acid with daily changes in solar radiation and air temperatures under field conditions, and the authors returned to that data for the observations reported here.

Procedure

The Seven Top turnip greens were grown at College Station on Lufkin fine sandy loam in rows three feet apart and the plants thinned to a three-inch spacing. A complete fertilizer of 5-10-5 analysis was applied at the rate of 1,000 pounds per acre, in bands three to four inches from the row and about two inches below the level of the planted seed. The station's customary methods for preparing the soil, cultivation, and weeding were followed (*7*).

Samples were obtained from two crops, those of the spring and the fall of 1948. The first harvest period began on May 3, 1948, and ended on May 28; the second period extended from March 7 to 30, 1949, inclusive, for the crop planted in the fall of 1948. Samples were analyzed on the five consecutive days, Monday through Friday, of each week in each entire harvesting period. However, plants were available for only three days in the last series of the fall crop. Each day's field sample consisted of horticultural duplicates, each of which contained a sufficient number of plants to provide a representative sample. When a number of constituents were to be determined for the regional study, from 20 to 30 plants made up each duplicate. When material for this study alone was needed, eight plants were harvested, this number having been shown to provide an adequate sample (*8*). The plants were taken from the plot at 8:00 A.M. by cutting enough of the crown to hold the leaves together, and the plants in each duplicate were wrapped in moisture-vapor-proof cellophane for the trip to the laboratory about 2 miles away.

In the laboratory, the leaves were cut off about two inches above the crown. To wash, three to five leaves were held loosely in each hand and moved up and down several times in an aluminum or granite pan with tap water running continuously into the container. As an alternate method, a few

[1] Published with the approval of the director of the Texas Agricultural Experiment Station as technical article 2647.

leaves at a time were placed in a 10-quart enamel pan well filled with tap water, and, with gentle handling, washed one by one. In either case, the leaves were then rinsed in a similar manner in a second container filled with tap water, and afterward, similarly rinsed twice in distilled water. Fresh water was used for each horticultural duplicate. The washed leaves were spread out on a cheesecloth shelf to drain, or placed on an enamel tray. Each leaf was then wiped with cheesecloth to free it of visible surface water and held in a covered enamel pan until all the leaves of a given sample were washed and wiped. Next, each leaf was deribbed by use of a sharp safety razor blade, and then three or four leaves stacked together and diced with a very sharp knife into pieces approximately one-half inch square. The entire lot of diced material was well mixed and from it were drawn the duplicate subsamples for chemical analysis.

TABLE 1

Radiation and air temperature from continuous recordings, crop of spring 1948

LAST DAY BEFORE HARVEST	RADIATION*			AIR TEMPERATURE† AT PLANT LEVEL		
	A. M.	P. M.	Total	Maximum	Minimum	Weighted Average
	g-cal/sq cm	*g-cal/sq cm*	*g-cal/sq cm*	*degrees F*	*degrees F*	*degrees F*
May 2	208	176	384	88	75	81
3	155	273	428	92	66	79
4	256	280	536	87	68	76
5	184	216	400	88	65	78
6	169	295	464	76	54	65
7	254	294	548	79	61	70
8	161	163	324	80	73	76
9	124	238	362	87	74	80
10	184	198	382	85	74	79
11	59	80	139	79	62	67
12	105	180	285	73	62	67
13	177	230	407	82	66	72
14	225	264	489	85	70	77
15	227	286	513	88	70	78
16	212	282	494	90	68	79
17	216	274	490	88	68	79
18	247	277	524	92	68	78
19	244	236	480	88	64	75
20	242	270	512	86	60	73
21	240	258	498	90	63	76
22	258	276	534	89	65	77
23	236	286	522	90	70	79
24	192	203	395	89	69	76
25	191	191	382	85	68	76
26	76	213	289	78	66	71
27	151	205	356	76	62	69
Average			428.3			

* Phototube integrator. Readings were converted to equivalent g-cal/sq cm by calibration with the pyrheliometer.

† From 8 A. M. on day indicated to 8 A. M. on the following day.

Dry matter was determined on 10-g subsamples by drying to constant weight in a forced draft electric oven at 65°C or a vacuum oven. The Morell method (*9*) as modified by Heinze, Kanapaux, Wade, Grimball, and Foster (*10*) was used to determine ascorbic acid in 10-g subsamples. All chemical analyses were made in duplicate. Record of solar radiation was obtained by means of a phototube integrator for the spring crop and with a pyrheliometer for the fall. Radiation values have been expressed as gram-calories per square centimeter. The recording thermometer was located at plant level. The charts were calibrated on an hourly basis, and from them were read the maximum and minimum values, and the weighted average was calculated for each 24 hours beginning at 8 A.M.

Results and Discussion

The data for radiation and temperature are given

TABLE 2

Radiation and air temperature from continuous recordings, crop of fall 1948–49

LAST DAY BEFORE HARVEST	RADIATION*			AIR TEMPERATURE† AT PLANT LEVEL		
	A. M.	P. M.	Total	Maximum	Minimum	Weighted Average
	g-cal/sq cm	*g-cal/sq cm*	*g-cal/sq cm*	*degrees F*	*degrees F*	*degrees F*
March 6	157	293	450	78	51	65
7	205	299	504	70	56	61
8	19	43	62	70	63	68
9	184	322	506	63	37	51
10	223	329	552	64	42	52
11	205	275	480	69	53	60
12	75	43	118	68	62	66
13	94	121	215	79	50	60
14	82	205	287	57	42	50
15	196	307	503	67	46	56
16	168	109	277	70	60	64
17	39	69	108	73	39	56
18	230	324	554	60	40	49
19	209	321	530	64	51	55
20	162	112	274	67	58	63
21	213	331	544	76	48	63
22	247	333	580	71	51	60
23	99	227	326	74	64	66
24	51	66	117	74	68	70
25	69	104	173	76	67	71
26	69	146	215	68	56	61
27	153	337	490	69	50	59
28	248	345	593	72	54	62
29	144	112	256	73	63	70
Average			363.1			

* Pyrheliometer.

† From 8 A. M. on day indicated to 8 A. M. on the following day.

in table 1 for the spring crop; in table 2 for the fall crop. The average values of duplicate determinations for dry matter (per cent) and for ascorbic acid, fresh basis and dry basis (mg/100g), are shown in table 3. Fresh basis ascorbic acid values are those obtained on leaf blade material prepared as described above. Dry basis values are calculated from the fresh values and the content of dry matter.

Charts 1 and 2 show, for the spring and fall crops, respectively, the trends for dry matter, ascorbic acid on the dry basis and on the fresh basis, and they facilitate comparison of the findings on these constituents. Trends for ascorbic acid fresh basis and for dry matter are consistently in the same general direction. Trends for ascorbic acid fresh basis and dry basis were similar in three out of four series for each crop. The ascorbic acid trend for May 17 to 21 is upward for fresh basis, downward for dry basis. The sharp rise in dry matter during this time explains the downward direction of the ascorbic acid values expressed on the dry basis. A similar though less conspicuous situation is seen for the three-day series, March 28 to 30, in the fall crop.

Chart 3 for the spring crop and chart 4 for the fall are presented to compare the trends of ascorbic acid fresh basis, radiation, and air temperature at plant level. Since the "day" for radiation and temperature ended at 8 A.M. on the following day, the greens harvested at 8 A.M. on the date shown were last subjected to light and temperature on the day bearing the immediately preceding date. In these graphs, lines in the curves for radiation and temperature connect only the points indicating data for the dates concurrent with the harvesting and analysis of the greens.

The similarity of the curves for ascorbic acid fresh basis and solar radiation is striking for six of the eight series—the first, second, and fourth in the spring crop, and the first three series in the fall crop. However, the short-time effect of radiation upon ascorbic acid content is indicated also in the curves for the remaining two series. In the third series of the spring crop the vitamin content rose continuously from 185.9 to 236.4 mg/100 g while the radiation remained on a very high level, ranging from 480 to 513 gram-calories. In the fourth series of the fall crop, where ascorbic acid values are lower, 150.0 to 159.9 mg/100 g, the sampling followed three consecutive days of low radiation, 117, 173, 215 gram-calories, whereas,

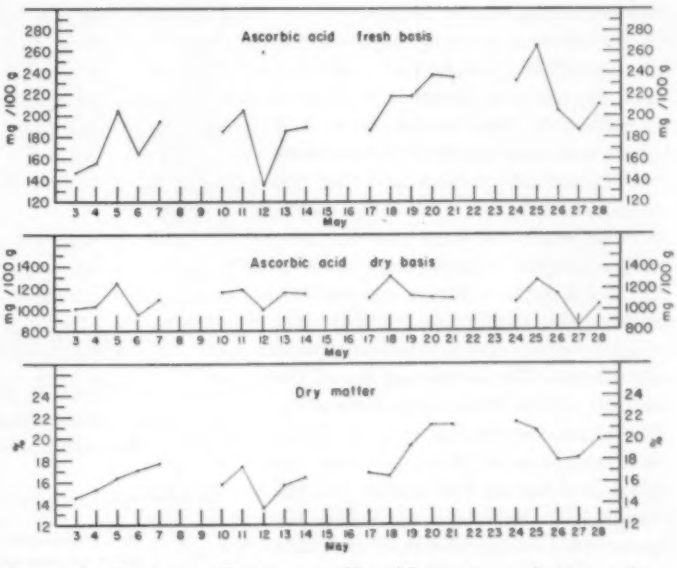

CHART 1. TRENDS IN CONTENT OF DRY MATTER AND ASCORBIC ACID IN LEAF BLADES OF TURNIP GREENS FROM THE SPRING CROP

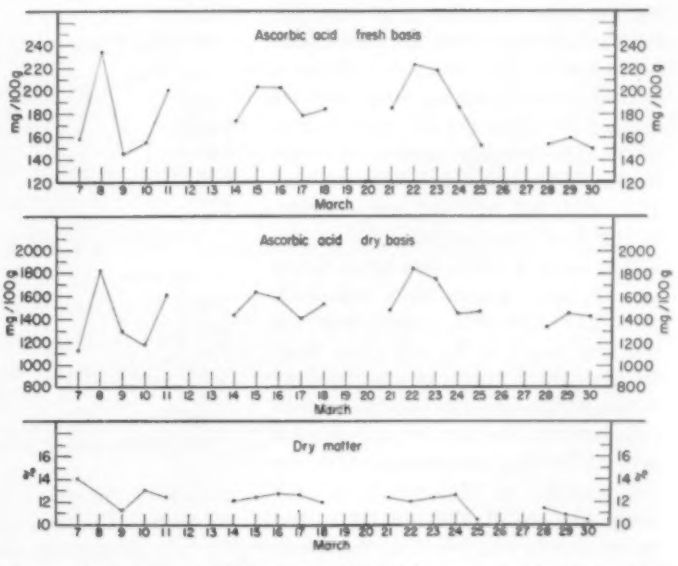

CHART 2. TRENDS IN CONTENT OF DRY MATTER AND ASCORBIC ACID IN LEAF BLADES OF TURNIP GREENS FROM THE FALL CROP

with the three preceding series, low radiation, 62, 118, 108 gram-calories, occurred at four- and five-day intervals for a single day only. Among the ascorbic acid values of 180 mg/100 g and above, four-fifths of them in the spring crop and nearly one-half of them in the fall occurred on days when the radiation was 300 gram-calories and above.

A statistical analysis supports the relation shown graphically (charts 3 and 4) between ascorbic acid concentration in the turnip greens leaf blade and solar radiation. Correlation coefficients were calculated for the ascorbic acid and total daily radiation for each series and for the four series together in each crop (table 4). In all cases the r values are positive. Among the coefficients for the eight single series, three are statistically significant. The coefficient for all the values within the entire harvesting period of the spring crop is 0.544, which approaches the 1 per cent significant value of 0.561. For the fall crop, the coefficient of 0.429 approaches the significant 5 per cent value of 0.468.

The pattern of temperature for the two crops differed (charts 3 and 4). Temperature was the more variable for the fall crop. Over the entire harvest period the weighted 24-hour averages for the spring crop hovered around 75°F; for the fall crop, nearer 60°F. The average number of hours below 75°F out of each 24 hours was 12.1, 19.2, 9.1, and 5.2, respectively, in the four consecutive series of the spring crop. Average number of hours per 24 hours below 60°F was 14.4, 19.3, 20.7, and 10.2, respectively, for the four series in the fall crop. Inasmuch as the averages of ascorbic acid values within series do not differ markedly between the two crops (table 3), it must be that temperature was not unfavorable on the whole to the accumulation of the vitamin. The ascorbic acid was lowest in the fourth series of the fall crop. Since the turnip is commonly considered to be best adapted to a cool season, and if, as some other studies have indicated (*3, 4*), a temperature near 50°F favors accumulation of ascorbic acid, there is the possi-

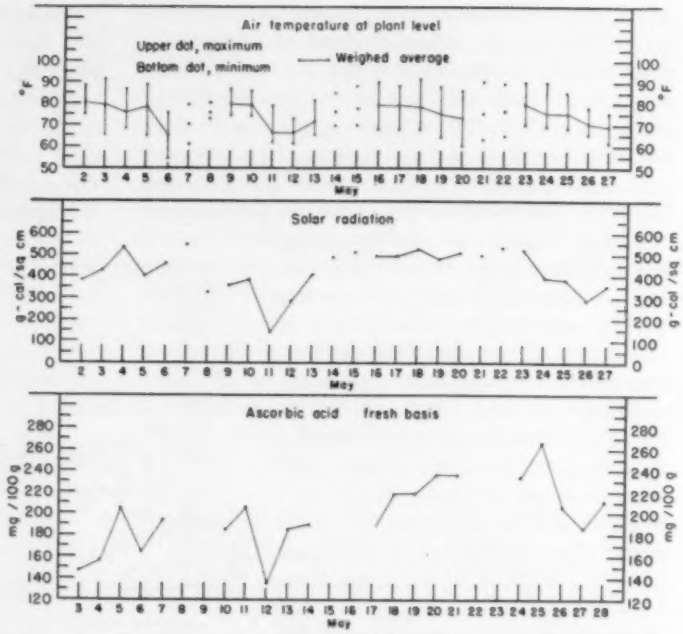

CHART 3. TRENDS IN ASCORBIC ACID, FRESH BASIS, IN LEAF BLADES OF TURNIP GREENS FROM THE SPRING CROP AND CONCURRENT SOLAR RADIATION AND TEMPERATURE AT PLANT LEVEL

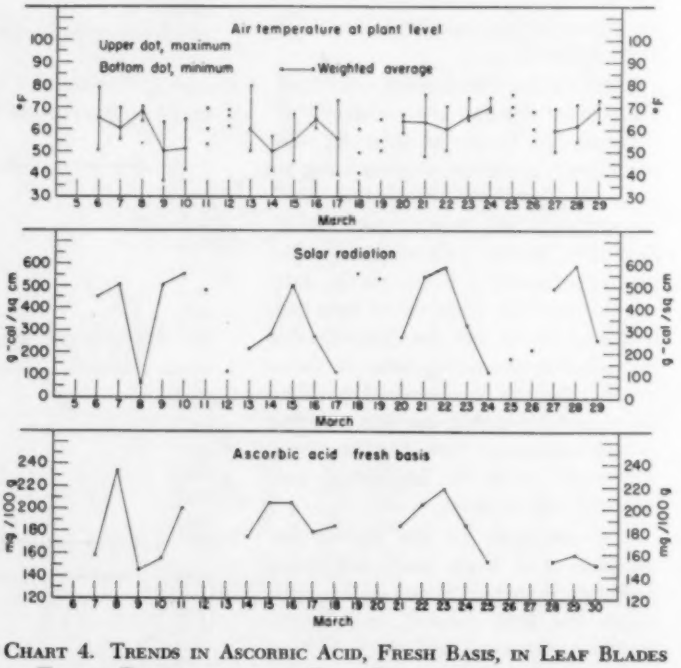

CHART 4. TRENDS IN ASCORBIC ACID, FRESH BASIS, IN LEAF BLADES OF TURNIP GREENS FROM THE FALL CROP AND CONCURRENT SOLAR RADIATION AND TEMPERATURE AT PLANT LEVEL

bility that the higher temperature on the second and third day preceding this three-day series (the fourth) may have played a part in lowering ascorbic acid content, even though the radiation was high, particularly on the first two harvest dates.

In this connection the following comment of Richardson (*2*) is of interest. He says that the net accumulation or amount of ascorbic acid found in a plant at any one time under observed conditions depends on three sets of reactions—(a) reactions which produce precursors of ascorbic acid—photosynthesis; (b) the biological reactions which take place to convert precursors of ascorbic acid; and (c) the amount of ascorbic acid used in respiration and in other metabolic processes. The net accumulation would depend on which system of reactions predominated.

Solar radiation must be regarded as the predominating factor influencing accumulation of ascorbic acid in the turnip green leaf blades in this study. By inspection of the graphs it will be seen that the effects noted would not have been apparent if the turnip greens had been harvested at greater intervals than daily.

TABLE 3

Content of dry matter and ascorbic acid in leaf blade tissue of turnip greens

CROP OF SPRING 1948				CROP OF FALL 1948–49			
Date Harvested and Analyzed	Dry Matter	Ascorbic Acid		Date Harvested and Analyzed	Dry Matter	Ascorbic Acid	
		Fresh basis	Dry basis			Fresh basis	Dry basis
	per cent	*mg/100g*			*per cent*	*mg/100g*	
1948				1949			
May 3	14.6	148.5	1015	March 7	14.1	158.6	1126
May 4	15.3	157.2	1030	March 8	12.8	233.5	1824
May 5	16.3	204.4	1258	March 9	11.2	145.4	1298
May 6	17.1	164.0	959	March 10	13.1	155.7	1187
May 7	17.7	194.3	1099	March 11	12.5	200.3	1602
Average		173.7	1072	Average		178.7	1407
May 10	15.8	184.8	1167	March 14	12.2	173.2	1431
May 11	17.3	205.5	1194	March 15	12.5	204.0	1632
May 12	13.7	136.7	1000	March 16	12.8	203.8	1592
May 13	15.8	184.8	1174	March 17	12.7	179.2	1411
May 14	16.4	189.0	1155	March 18	12.0	184.5	1538
Average		180.2	1138	Average		188.9	1521
May 17	16.8	185.9	1107	March 21	12.4	185.2	1493
May 18	16.6	218.6	1315	March 22	12.1	222.6	1840
May 19	19.3	218.7	1133	March 23	12.4	218.7	1764
May 20	21.3	238.1	1120	March 24	12.7	185.3	1465
May 21	21.3	236.4	1110	March 25	10.3	152.8	1464
Average		219.3	1157	Average		192.9	1609
May 24	21.6	232.2	1081	March 26	11.5	153.5	1334
May 25	20.8	267.0	1287	March 29	10.9	159.9	1467
May 26	18.0	206.0	1145	March 30	10.5	150.0	1436
May 27	18.2	167.6	853				
May 28	19.9	211.1	1062				
Average		220.8	1086	Average		154.5	1412

Observations of other workers, with one exception (*6*), are in accord with the findings of this study. Reder (*11*) at the Oklahoma station found 15 per cent less ascorbic acid in turnip greens harvested after two days of decreased sunshine than in samples from the same plot harvested two weeks earlier in fair weather. Turnip greens grown in outdoor bins at the North Carolina station and harvested in two sunny periods were found by Miller (*12*) to contain 25 to 34 per cent more ascorbic acid than did those from two harvests in dull weather. In a second study, Miller, Army, and Krackenberger (*13*) found 34 per cent more ascorbic acid in the greens harvested after six sunny days than in those harvested after a period of cloudy weather. In contrast, Eheart, Young, Massey, and Havis (*6*) report no significant difference in ascorbic acid content in three crops of turnip greens, field grown at the Virginia station, as a result of 50 per cent reduction in light intensity by shading with cheesecloth. These authors note that their finding is "unaccounted for."

To compare effect of sun and shade on accumulation of ascorbic acid, Somers and Kelly (*5*) shifted turnip greens growing in sand in pots from shade house of cheesecloth, where light was about one-third of full amount, to sun outside the house, and vice versa. Consistently, analyses at 2, 5, 8, and 11 days after the shifting in one experiment, and at 2-day intervals in another experiment on whole plants, leaf blades, midribs, and hypocotyls, showed that the ascorbic acid content quickly increased when plants were put in sunlight and decreased, more slowly, when shifted from sun to shade. Hamner and Parks (*1*) exposed turnip greens to 200, 600, 800, 3,000, and 5,000 foot-candles for one week. Those exposed to 5,000 foot-candles contained more than eight times as

TABLE 4

Correlation coefficients (r): radiation and ascorbic acid fresh basis

SPRING CROP 1948			FALL CROP 1948–49		
Series	Harvest Dates	r*	Series	Harvest Dates	r*
	May			March	
1	3 to 7	0.924†	1	7 to 11	0.564
2	10 to 14	.917†	2	14 to 18	.636
3	17 to 21	.015	3	21 to 28	.986‡
4	24 to 28	.537	4	28 to 30	.926
All		.544†	All		.429

* Significant r for all series:
Spring, 1 per cent = 0.561 Fall, 1 per cent = 0.590
5 per cent = 0.444 5 per cent = 0.468
† Significant at 0.05 level.
‡ Significant at 0.01 level.

much ascorbic acid fresh basis as those subjected to 200 foot-candles. Ascorbic acid content increased when plants were changed from low to high light intensity, decreased at a slower rate with change from high to low intensity.

In studies where change in temperature was a variable, Somers and Kelly at the U.S. Plant, Soil, and Nutrition Laboratory (*4*) subjected one half of an experimental lot of turnip greens in pots to a temperature of 50°F (10°C) at nights, the other half to 70°F (21.11°C), and all plants during the day were under the same temperature and illumination (600 to 800 foot-candles, or normal mid-July sunshine). Ascorbic acid per unit of fresh weight was significantly higher in the plants held at 50°F during nights, although the two lots of plants were the same size in both fresh and dry weight. Sheets and McWhirter (*3*) at the Mississippi Agricultural Experiment Station found 18 per cent more ascorbic acid in the ribs and 21 per cent more in the blades of turnip greens grown in pots that had been kept in the refrigerator during each of four nights compared with those kept on a laboratory table.

Summary and Conclusions

The leaf blades of field-grown Seven Top turnip greens were analyzed for content of ascorbic acid and dry matter in samples harvested daily Monday through Friday over four consecutive periods in a spring and a fall crop. Continuous records were kept of solar radiation and of temperature at plant level. Ascorbic acid on both the fresh and the dry basis showed similar trends except in one five-day series when a sharp rise in dry matter lowered the ascorbic acid on the dry basis.

A clear-cut association of ascorbic acid concentration with the radiation of the 24 hours preceding harvest is shown both graphically and by the simple correlation coefficients between vitamin and radiation values. All coefficients are positive. For the four series together in each crop, the coefficient for values in spring (0.544) approaches statistical significance at the 1 per cent level (0.561); and for the fall values (0.429) approaches significance at the 5 per cent level (0.444).

While temperature was less variable for the spring than the fall crop and the weighted average approached 75°F in spring and 60°F in fall, neither season's temperature appears unfavorable to accumulation of ascorbic acid, with the possible exception of the last fall series when higher temperatures along with lower radiation preceded harvest.

Radiation must be regarded as the predominating factor influencing ascorbic acid formation by the greens in this study. This close relationship would not have been so clearly evident had the greens been harvested and analyzed less often than daily.

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Grateful acknowledgment is made: to Lucille J. Ward, Margaret K. Thomas, Sylvia Welch, Lillie B. Bass, and Mildred H. Gabbard for help in preparing the samples for analysis; to Helen F. Darling for assistance in preparing samples, tabulating and analyzing data, drawing graphs, and typing the manuscript; and to C. B. Godbey for guidance in statistical analysis and interpretation of the data.

This article presents a report of experimentation with a drawing board procedure for estimating savings in distances walked that can be gained by the rearrangement of supplies and utensils in home kitchens. The findings will be of practical usefulness both to researchers and to homemakers.

Savings in Distance Walked in Kitchens through Reorganization of Storage and Work Space

May L. Cowles, Sara M. Steele, and Mary B. Kishler [1]

Dr. Cowles, a professor in the School of Home Economics at the University of Wisconsin, teaches and conducts research in family economics and housing economics. Miss Steele, home agent in Grant County, Wisconsin, was a research assistant and candidate for a master's degree when this study was made. Mrs. Kishler, also a research assistant at the University at the time of this study, is now in Oxford, England.

ANY evaluation of the time spent in doing household activities recognizes that the way in which the individual worker organizes her working areas and carries on her work is extremely important. This was apparent in a study previously reported.[2] Certain readily measurable factors, including household size and period of the family cycle, were found to be important in determining the amount of time spent in homemaking activities. It was evident, however, that the methods of work employed by the worker, though difficult of measurement, were at least equally significant.

The present study reports an attempt to set up and to evaluate a method of measuring the organization of kitchen storage and work areas used in 56 homes and of checking the effectiveness of that organization. For various reasons, food preparation, which is carried on in every household and ordinarily takes more of the family's time than any other type of household work, was selected as the activity to be studied. It is normally carried on in one functional area in a house, the kitchen. Further, since the organization of the work and storage areas was to be investigated rather than the arrangement of the major pieces of equipment, it was important to make the study in the only portion of a house in which the arrangement could be numerically evaluated.

Method

The study involved the kitchens of 56 rural homemakers, selected from the 85 women whose time records had been reported in the study previously mentioned. These kitchens were revisited, exact measures were taken of the room and all its equipment, and the use of each storage area or counter space was noted. The floor plan and each elevation of the kitchen were then drawn to a large scale. Each kitchen arrangement was rated by the University of Illinois score in order to discover its conformity to standards of kitchen planning.[3]

A standardized procedure for getting a meal was set up, designed to involve all parts of the food preparation area, and to use a variety of processes, equipment, and materials. For convenience in charting, this procedure was arranged in six steps. For each kitchen, the routing involved in each step was plotted on a large-scale drawing, and the distances to be walked were measured.

The kitchen was then reorganized on the drawing board without changing the essential arrangement of the furniture and major pieces of equipment such as sink, range, and cupboards. It was assumed that remodeling of the kitchen was not to be done and that the Illinois score would remain

[1] Based on work done at the Agricultural Experiment Station, University of Wisconsin, as part of Hatch 824.

[2] Time spent in homemaking activities by a selected group of Wisconsin farm homemakers, M. L. Cowles and R. P. Dietz, *J. Home Econ.* **48**, No. 1 (Jan. 1956), pp. 29-35.

[3] This was done by using the score sheet devised by Helen E. McCullough, reported in *How to Score a Kitchen Plan*—Handbook of Kitchen Design, pages 72-73, Small Homes Council, University of Illinois, 1950. The score is based on standards set for optimum distances between important work centers, for the amount of storage and of counter spaces, and for the relation of these to each other and to the work centers.

the same throughout. The changes made were mainly concerned with organization and storage of materials, tools, and movable equipment. The standardized procedure was applied to the reorganized kitchen, and the distance a worker would be required to walk was again determined.

Results

A preliminary test. In a preliminary study of the 56 kitchens, it was found that to get the standardized meal and wash the dishes following it, the distance to be traveled ranged from 151.6 feet to 597.1 feet with an average of 328.9 feet. After the kitchens were reorganized, the distances were in every case less than under the original kitchen organization. In 10 per cent of the kitchens, the saving effected was less than 25 feet; in 28 per cent less than 50 feet. However, in nearly one-third, or 32 per cent, the distance saved amounted to 100 or more feet, with an average saving of 81.7 feet, or 24.8 per cent of the original distance.

As the kitchens were originally organized, in more than a third (36 per cent) it would have been necessary to walk 350 or more feet to carry through the standard procedure, and in more than a fifth, 400 or more feet had to be traveled. On reorganization, in only 10 per cent was it necessary to walk as far as 350 feet, and in only one, 400 feet.

A second test. Though the results of the preliminary check were definite and positive, the question arose as to the possibility of the reorganization's being useless when applied to another set of procedures. Reorganization of the kitchens had been made with the specific standard meal in mind. Hence it was felt that another and more lengthy standard meal procedure should be set up and the same measures of each kitchen as originally organized and as reorganized should be taken. This was done for the 56 kitchens.

Since the standardized procedure employed in the second test was longer and more elaborate than that in the preliminary test, the original distances to be walked were considerably greater, ranging from 496.1 feet to 1,881.2 feet with a mean of 887 feet. More than a third (37.5 per cent) of the kitchens required between 700 and 899 feet to carry on the procedure, about one-fourth (23.2 per cent) between 900 and 1,099 feet, and more than a fourth (26.8 per cent) 1100 feet or more.

After relocation and reorganization of stored items in the 56 kitchens, application of the standard procedure showed substantially shorter distances in every case, ranging from 384 feet to 1,261 feet. The average distance, 616 feet, was 30.5 per cent less than the 887 feet required before reorganization. In more than one-fourth of the kitchens (28.6 per cent) the distance required was less than 500 feet, and in only two kitchens was the reorganized distance as great as the average distance before reorganization. The savings in distances in preparing the meal ranged from 33.1 feet to 752.2 feet or from 6.7 per cent to 52.2 per cent of the original distance required.

Each kitchen, then, showed savings in distances to be walked when the reorganization applied in the preliminary study was used with the newer and more lengthy procedure. Correlation coefficients were calculated on the absolute and the relative savings obtained by the two tests. Absolute savings showed the highly significant correlation of 0.87; the percentage savings showed a correlation of 0.69, which, though smaller, indicated a significant relationship between savings obtained in the two different tests. It was concluded, therefore, that the relocation and reorganization which accomplished substantial savings in carrying on one standard procedure were fundamental in nature and were efficacious in producing comparable savings in carrying on other procedures.

In most kitchens, reorganization reduced the number of feet to be traveled to a fairly standard distance. Not only was the range in distances to be walked much less than in the original kitchen setup, but about two-thirds (66.1 per cent) of the reorganized kitchens required between 450 and 650 feet of travel to carry on the standard procedure of the second test. This suggests that a "standard" organization of a kitchen may be aimed at which can be used even if the arrangement in terms of built-in features is not optimum.

The kitchen size was found to be directly related to the original distance to be walked but showed no relation to the percentage saved by reorganization of materials and equipment.

However, with the initial distances greater in large kitchens, the absolute savings in number of feet were greater in the kitchens with large areas. Since multiple uses of the kitchen in modern houses have meant a swing toward larger kitchens, the food preparation area needs to be carefully studied as to location of equipment and supplies. It is evident that these can be placed in a relatively small area, regardless of total kitchen size.

Where Changes Were Most Needed

Analysis of the type of changes made in the reorganized kitchens showed that more than half (55.6 per cent) of the separate items of food and pieces of equipment had needed some change in

location—51.6 per cent of the food items and 58.3 per cent of the equipment. The items of equipment most frequently in need of relocation were measuring cups or spoons, saucepans, various types of knives, stirring spoons, serving bowls, and platters. The foods which were most often relocated were potatoes, flour, seasonings, and purchased canned goods. Of the total items in need of relocation, 19 per cent could not be shifted unless major remodeling of the kitchen were possible. More savings in distances traveled could have been made in many of the kitchens if changes involving remodeling had been done.

The work area most in need of reorganization was the range center; the mix center needed the least. This is indicated by the proportion of the items used in the centers needing relocation:

	ALL ITEMS per cent	FOOD ITEMS per cent	EQUIPMENT ITEMS per cent
Range center	71.0	67.2	73.9
Sink center	58.7	63.6	58.0
Dining and serving center	53.3	53.5	53.1
Mix center	45.1	38.8	49.8
All centers	55.6	51.6	58.3

As these data indicate, nearly three-fourths of the pieces of equipment and more than two-thirds of the food items used in the range center were in need of relocation. These large proportions were partly the result of a small amount of storage space customarily found at or near the stove. In part, they were due to the habit of putting all cooking receptacles and small equipment together regardless of where they were to be used. In the mix center, on the other hand, only about half of the equipment items and nearly two-fifths of the food items needed relocation. It is possible that a reason for less need for reorganization of the mix center is that it has received major attention by extension workers and others when desirable kitchen arrangement has been discussed.

Arrangement in Relation to Distances Walked

Since each kitchen had been rated by the Illinois score, the degree of excellence of the arrangement of its built-in equipment, including sink, range, cupboards, and counter space, was known numerically. It might be supposed that those kitchens with high scores, indicating conformity to optimum standards for kitchen arrangement, would be best organized, with few relocations needed.

As may be seen in table 1, a definite inverse relationship was found between the original distance to be walked and the Illinois score, with the higher scoring (or better arranged) kitchens requiring the shorter distances to carry on the standard procedure. To a lesser degree the same trend is seen with the distances required after reorganization. Some relationship, though slight, is indicated between the percentage saved by reorganization and the excellence of arrangement. The 28 kitchens with the highest scores had somewhat fewer relocations than did those with the lowest scores, though the number made per kitchen in the lowest quartile was very nearly the same, on the average, as those with higher scores. This may have been because many of the kitchens with the lowest scores were in need of remodeling which would have made more relocations possible.

However, even the highest scoring kitchens were found to need reorganization. For example, in the only kitchen scoring 100 (the perfect score), 19 relocations were made, resulting in a saving of 184 feet or 27.7 per cent of the distance walked before reorganization. For the entire group of kitchens in the quartile with high scores, a total of 292 relocations was suggested with a very considerable saving in distances to be walked.

These results indicate that though good arrangement of working areas in a kitchen, with optimum relationships between the various centers, is desirable, good arrangement does not guarantee an "efficient" kitchen. The organization and location of supplies and equipment, which can only be done by the worker herself, are factors of equal importance. It is clear, too, that tenants or those who for other reasons are unable to remodel their kitchens, can go far toward making it possible to carry on work with small amounts of walking by careful organization of storage spaces, even though these are not optimum in location or amount.

How the Savings Were Effected

While each kitchen presented an individual problem, the reorganization made use of generally accepted principles for carrying on work efficiently.

TABLE 1

Mean distances to be walked before and after reorganization of kitchen storage spaces, according to excellence of arrangement

ILLINOIS SCORE		FEET PER KITCHEN WALKED IN STANDARD PROCEDURE		MEAN PERCENTAGE SAVING	NUMBER OF RELOCATIONS PER KITCHEN
By Quartiles	Range	Before Reorganization	After Reorganization		
Highest	100 to 73	757.8	520.2	30.2	19.5
Second	72 to 53	876.0	549.4	36.5	23.3
Third	49 to 16	1,091.8	644.4	40.1	32.0
Lowest	14 to minus 51	1,213.8	760.4	37.1	24.8

These were the ones most frequently used:

1. Storage of apparatus and supplies at the place of first use. It was found that the homemaker's concept of a "neat" kitchen often led her to store similar materials in a given spot, regardless of where they were needed. Sometimes in the original kitchen their storage place was determined by placing together receptacles of the same size. In some cases a long distance was traveled each day to obtain such food as potatoes, which were stored in the basement. It was suggested that a small supply be kept at the place of first use, usually the sink where they were washed and pared. Those saucepans which must be filled with water, or foods which must be washed, were often kept at a considerable distance from the sink.
2. Duplication of inexpensive materials and equipment needed in more than one place. Homemakers were occasionally found to do this with salt, but the idea was seldom applied to such items as flour, sugar, non-refrigerated cooking fat, measuring cups and spoons, stirring spoons, or forks. Flour and sugar, for example, were typically stored in only one place in the kitchen. Often they were across the room from each other, though frequently needed together.
3. Placing all materials and equipment used in a single type of process in the general area in which the process was to be carried on. Current practice in preparing a meat dish, for example, frequently found the frying pan in one place, flour for dipping the meat in another, the dish to hold the flour in another, fat in still another, and perhaps the fork to turn the meat in still another. The whole process, of course, needed to focus on the place where the meat was to be cooked.

Relocation often led to the question of inadequacy in amount of storage space available at the right place. Since the project excluded reorganization involving remodeling, this became a problem in some kitchens. However, it was found that more effective use of available storage shelves or cupboards was often possible. Sorting out infrequently used equipment or materials not used in food preparation and getting them out of the kitchen often made available the storage space needed in kitchen work areas.

Checking Results by Other Methods of Measurement

The foregoing results, obtained by a drawing board study of the 56 kitchens, might conceivably be called into question if compared with measurements of distances walked by an actual worker in preparing the standard meals. A study was therefore planned to check the validity of the drawing board technique.

One of the proposed methods was to carry on the reorganization in a number of the kitchens already studied, with the standardized meal actually prepared in the "before and after" kitchens. Since all of the 56 were "home" kitchens, and since the meal preparation must be done by the same trained worker over a period of time, considerable interruption of the household routine would be involved. This, therefore, was not considered a practical method for taking prolonged observations.

The method used was to "synthesize" a kitchen as nearly as possible corresponding to an average of the 56 kitchens and to carry on in it a standardized procedure which could be measured by various means. One of the unit kitchens of the foods and nutrition department at the University of Wisconsin was utilized. Its rating by the Illinois score was 69, which would have placed it in the second highest quartile, compared to the 56 kitchens.

To locate the foods and equipment in this kitchen approximating as nearly as possible the locations used in the 56 kitchens, the places where these items were stored were studied. In each of the 56 kitchens, the location of each food and equipment item was measured as to (a) distance from probable place of first use; (b) distance from floor; (c) type of storage area, whether cupboard, drawer, open shelf, or counter top; and (d) the center in which located. The median distances for (a) and (b) were used to determine where to place the item in the synthesized kitchen. The type of storage area and the center of greatest frequency were used if feasible. Thus the arrangement of the synthesized kitchen represented as nearly as possible average locations of each item of food or small equipment in the 56 kitchens.

With the places for storage in the synthesized kitchen determined, observations on possible savings by reorganization and relocation of equipment and food were made by three methods: (a) the drawing board technique used in the previous tests in the 56 kitchens, (b) memomotion filming, and (c) readings made by an observer.

A new standardized breakfast procedure [4] was formulated so that a complete meal would result

[4] The standardized procedure used in the second test on the 56 kitchens could not be used because it was so lengthy that repeated filming of it was not practical.

and so that all centers of the kitchen and the more common items of food and equipment would be used. The order in which the various processes were done was determined by the most logical way to proceed, considering length of preparation and cooking time needed. This standardized procedure was carried out in the synthesized kitchen using the drawing board technique—drawing the plan and elevations on a large scale and measuring the routings on the plan. The kitchen was then reorganized on paper, and the standardized procedure again carried out and routings measured.

To compare with these data, observations were made of the breakfast procedure as performed by a trained operator.[5] In order to make distance measurement possible, the floor was marked into one-foot squares so labeled as to make each movement readily traceable. Before readings were taken, the operator went through the standard procedure 15 times, with the kitchen in its original organization and as reorganized. This helped to eliminate variation due to lack of familiarity with the kitchens and processes and the order in which these were to be done. Though the worker became extremely familiar with the process, an observer read each step to her as she carried it out in order to avoid the necessity of depending on memory.

The filming was done by Professor R. L. Daggett[6] with the assistance of R. A. Ratner, both of the department of mechanical engineering. The procedures—both before and after reorganization—were repeated a number of times so that the data given represent averages of a number of readings. Analysis of the films was made by projection on a small screen in a dark shadow box to allow close viewing in a lighted room.

At the same time the filming was done, the step-by-step routing was followed and recorded by an observer. It was thought that this method of obtaining readings would be of value if filming the procedure were not possible. Comparison with the film readings would show the direction and amount of variation from the more accurate memomotion data. This method proved to be the most difficult of the three, since alertness and speed were necessary in order to record accurately each route traveled. Averages of the data obtained by the three methods are seen in table 2.

TABLE 2

Mean distances walked in synthesized kitchen in carrying out a standardized breakfast procedure as measured by three methods

METHOD OF MEASUREMENT	FEET WALKED IN KITCHEN		SAVING	
	As Originally Organized	As Reorganized	Feet	Percentage
Drawing board technique	371.1	259.5	111.6	30.1
Memomotion film	318.4	229.5	88.9	27.9
Recorded by observer	307.1	222.6	84.5	27.5

As seen in this table, the distances measured by the drawing board technique were consistently greater than those measured by the other two methods. This is to be expected, since in measuring on the large-scale plan no account could be taken of the ability of the operator to get materials by reaching, or by shifting weight from one foot to the other without otherwise moving. The film, therefore, showed no measurable distance traveled in these cases, whereas in the drawing board measurement, such motions were necessarily counted as distance walked.

The distances as recorded by the observer both in the kitchen with its original organization and as reorganized were slightly less than the distance shown by film analysis—by 3.5 per cent and 3.0 per cent, respectively. It is possible that the differences were due to the observer's not being quite speedy enough to identify each square touched, especially if the movement occupied a very short time. However, the percentages of distance saved as measured by the two methods of observation were almost the same—27.9 per cent and 27.5 per cent. These compare with a savings of 30.1 per cent when measured on the drawing board. The film recorded the actual process, and in its analysis each frame could be observed at length and repeatedly, with careful calculation of distance by means of the numbered squares on the floor. Further, since the film could be run over and over, checking the readings could be done, whereas checking of those taken by the observer was impossible. Hence, the film reading was accepted as the accurate one.

It may be concluded that if the memomotion camera is available and sufficient time is allowed

[5] The writers wish to acknowledge the valuable assistance and co-operation of Betty M. Rehfeld.

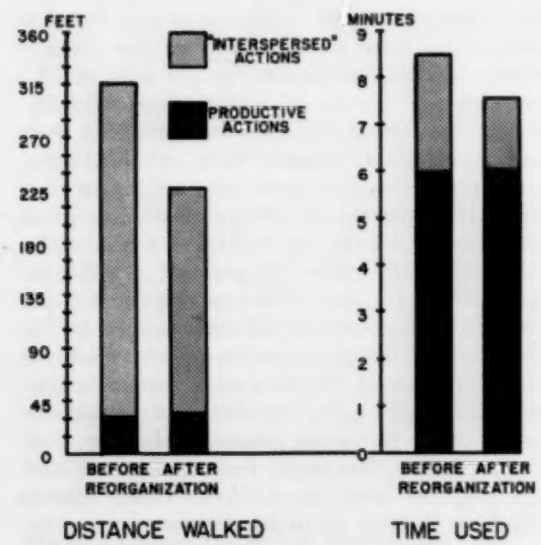
[6] Valuable suggestions as to the planning and setting up of this part of the study were given by Professor Daggett, and the results were also studied by him. The camera used, owned by the department of mechanical engineering, was a Cine-Kodak Special II, equipped with a synchronous motor drive with gear adapters from 100 to 1,000 frames per minute. The film used was Cine-Kodak Plus X Reversal Safety, 16 mm.

for analysis, this offers a superior method of studying kitchen organization. However, a substitute reasonably satisfactory for measuring distance is careful recording of the process by an observer. A less satisfactory method, but one which can be utilized when there is no opportunity to observe an operation under laboratory conditions, is the drawing board technique, in which the routing is plotted on large-scale plans. This method has the advantage of being applicable to any home kitchen in which the necessary measurements can be taken.

Relation of Distance Walked to Time Used

Analysis of the films gave opportunity for careful study in terms of the types of motions used, including the time taken for various types. A question which was frequently asked was whether saving in distances walked resulted in a proportionate saving in time.

Though the total distance saved by reorganization of storage spaces averaged 27.9 per cent, the time used for preparation of the meal was reduced only 10.5 per cent. This led to an analysis of the types of processes which made up the entire procedure. Two "action" groups were delineated: the manipulative or productive actions which resulted in the finished product—that is, the bacon, eggs, toast, coffee, and juice, composing the breakfast—and the operations interspersed between these actions—largely walking to get out food and equipment or to return them to their places of storage. As is clearly seen in the chart, the saving in distances walked was found to be considerably greater in the number of feet walked between actions than in those used in productive or manipulative actions, many of which the operator performed while standing still. The distance walked between actions was reduced by 33.0 per cent whereas the distance traveled while carrying on productive actions was slightly increased.



DISTANCE WALKED AND TIME SPENT IN PREPARING A STANDARD BREAKFAST BEFORE AND AFTER REORGANIZATION OF "SYNTHESIZED" KITCHEN

The manipulative or productive actions occupied the greater proportion of the total time (70.6 per cent in the original kitchen and 80.3 per cent after reorganization) during much of which little walking was involved. Hence, it was concluded that in the particular procedure studied, saving in distance walked by reorganizing the storage and work areas was not an indicator of the amount of possible saving in time attributed to this reorganization, although some saving in time did occur. In other procedures in which less of the time is spent in manipulative actions, it is possible that greater time saving would result.

Summary

To measure possible distances saved by reorganization and relocation of food and equipment, 56 kitchens as found and as reorganized were studied by means of a standard meal procedure. Before-and-after measurements were taken by plotting routings on large-scale drawings. The suggested relocations were rechecked by using them with another and more complex standard meal. Significant savings in distances to be walked were found in both tests. These savings were achieved by placing food and equipment at points of first use, duplicating small and inexpensive items when desirable, and placing together all items needed for a single process.

The results were further tested in a "synthesized" kitchen with locations of food and equipment determined by average locations in the 56 kitchens. Readings before and after reorganization were taken by the drawing board method previously used. The standard procedure was then performed by a trained operator; readings were taken from a memomotion film and from records of an observer. Comparisons between readings showed longer distances traveled and slightly higher percentage savings as determined by the drawing board technique since the ability of the operator to get materials by reaching or shifting weight, without otherwise moving, could not be gauged on the drawing. The other two readings were quite close together.

Analysis of the memomotion film showed that percentage savings in distances walked after kitchen reorganization were much greater than the per cent of time saved. This was because manipulative or productive actions used a large amount of time in the procedure but did not always involve movement from place to place.

This series of three articles is a continuation of the work reported in the March 1956 issue of the JOURNAL OF HOME ECONOMICS. *It evaluates some of the efforts toward summer comfort which can be effective in conventional houses in hot, dry western climates.*

Temperature Control for Houses[1]

Richard D. Cramer, R. B. Deering, Virginia Gould Kay, and L. W. Neubauer

The authors are members of the faculty of the University of California at Davis. Mr. Cramer is assistant professor of housing in home economics, Dr. Deering is assistant professor of landscape management, Mrs. Kay is assistant professor of decorative art in home economics, and Dr. Neubauer is associate professor of agricultural engineering.

IV. Temperature Control with Shading Devices

L. W. Neubauer, Richard D. Cramer, and R. B. Deering

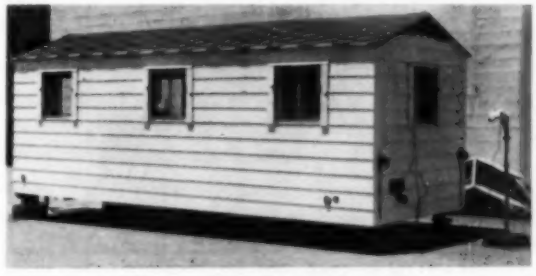
This report is the fourth in a series describing experimental results obtained by measuring temperatures in and around a cottage-type house trailer. The project was undertaken to survey methods for the alleviation of excessive summer heat in light-weight wood-frame residences in hot, dry climates. One of the possibilities—the use of shading devices—is explored herein. Details of recording instruments and preliminary results were explained in articles I, II, and III in the JOURNAL OF HOME ECONOMICS in March 1956 (*1, 2, 3*).

Instrumentation and Measurements

It will bear repeating that the principal installation for measuring temperatures consists of thermocouples located in the surfaces of the walls, floor, roof, and ceiling of the trailer and in the air itself, indoors and out. Temperatures were recorded automatically every 30 minutes by a commercial Brown potentiometer or millivoltmeter, a balancing motor, and a decade switch which activated an electric IBM typewriter (*1*).

Each result listed is the average experience of several days' duration. This procedure provided for verification of individual readings and ruled out variables caused by occasional abnormal weather.

[1] Western Regional Housing Project W-8 "The Improvement of Rural Housing in the Western Region." University of California at Davis Cooperative Project No. 1536.



The experimental housing unit

Heat Sources When Fully Exposed to the Sun

Warming of the trailer interior was caused by the sun's heat, directly by the portion of radiation which penetrated glass areas and by the portion absorbed by exterior surfaces of wall and roof materials, and indirectly by heat convected to these surfaces from the warmed outside air. Infiltration of outside air was negligible because the trailer was kept tightly closed during the measurements. The critical importance of direct radiation is indicated in chart 1, which shows average summer temperatures of the exterior surfaces of white walls and dark roof, when exposed to the sun. The roof was of green asphalted composition shingles.

In summer east and west exposures were more vulnerable than north and south. Total heat absorptions by east and west walls were nearly equal to each other. However, in terms of distribution, west

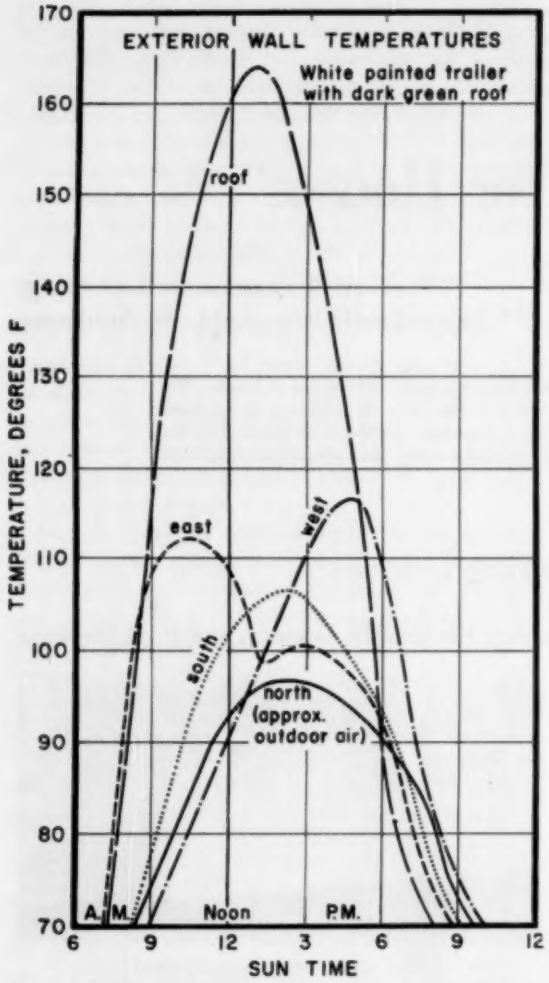


CHART 1. The trailer was fully exposed to the sun. The curves show temperatures of exterior surfaces of wall and roof materials.

experienced higher maximum temperatures while east experienced temperatures higher than the outside air for a longer period of time. In the case of the west wall, maximum outside air temperatures nearly coincided in time with maximum radiant gain. In the case of the east wall, these two heat sources were four or five hours apart. The south wall received less solar radiation than east or west because of the high angle position of the summer sun, and so south wall temperatures were significantly lower. North wall temperatures were virtually the same as surrounding outdoor air temperatures, except for slight radiant gains in early morning and late evening when the sun rises and sets north of the east-west line.

In contrast, the dark-colored roof surface frequently exceeded 160°F, once attaining a maximum of 172°F, and was relatively hot during the middle of the day. Judging from the results in lines 4, 5, 6, and 7 of table 1, these extremely hot roof surfaces constituted a source of heat flow into the trailer about as great as the gains through small glass areas.

Typical Results When Shading Methods Are Attempted

A general comparison was made of different methods of shading, in an attempt to interpret the value or utility of each. These data are summarized in table 1.

When the trailer was fully exposed to the sun, the average maximum interior air temperature was 13°F above the average maximum outdoor air. The other conditions produced by the shading devices listed in lines 2 through 10 were of varying advantage in reducing interior air temperatures, as shown. It should be noted that this is but one comparison which can be made. An examination of the 24-hour temperature pattern is necessary for a complete diurnal evaluation. For this information see charts 2 and 3.

Living Shades:

Line 2. On a *grass lawn or turf,* the slight cooling

TABLE 1

Trailer comfort improvement: Comparison of interior air temperatures with outside air temperatures, showing the degree of improvement attained by varying the location and condition of the trailer

LOCATION AND CONDITION OF TRAILER	AVERAGE MAXIMUM INTERIOR AIR TEMPERATURE MINUS AVERAGE MAXIMUM OUTDOOR AIR TEMPERATURE	REDUCTION OF AVERAGE MAXIMUM INTERIOR AIR TEMPERATURE BELOW THAT OF THE NORMAL CONDITION (line 1)
1. Pavement or soil: no shade	13°F	0°F
2. Lawn: no shade	11°F	2°F
3. Soil: east tree shade	10°F	3°F
4. Pavement: canvas umbrella roof (dark color)	7°F	6°F
5. Pavement: canvas umbrella roof (whitewashed)	6°F	7°F
6. Soil: canvas awnings over windows	6°F	7°F
7. Soil: roof painted white	5°F	8°F
8. Soil: partial hop vine shade	1°F	12°F
full hop vine shade	−3°F	16°F
9. Lawn: west tree shade	−5°F	18°F
10. Lawn: full tree shade	−9°F	22°F

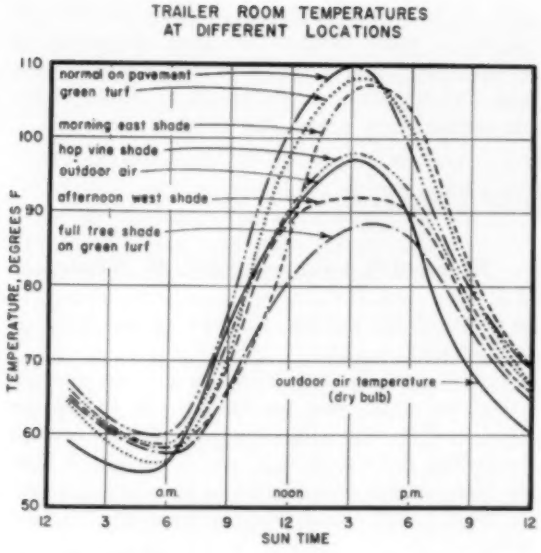


CHART 2. The curves show the effects of different kinds of natural shade on trailer room air temperatures. The curve labeled "hop vine shade" refers to the partial condition (line 8) in table 1.

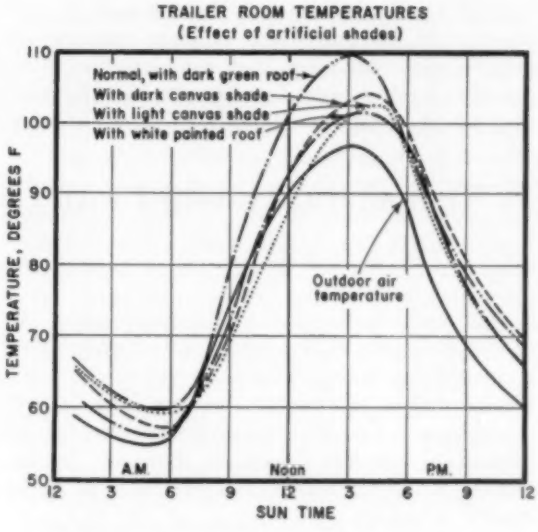


CHART 3. The curves show effects of different kinds of artificial shade on trailer room air temperatures.

effect was caused by a reduction in the reflection of radiation from the ground and by the lawn's transpiration. Probably the former is the more significant.

Line 3. East shade trees were effective in the morning but left the trailer exposed to the sun during the afternoon, the time of the highest outdoor air temperatures. Beginning at noon, roof and south and west wall temperatures rose quickly, resulting in a rapid loss of the advantage of a cool morning.

Line 8. When shaded by *hop vines,* radiant gain was virtually eliminated and so maximum room temperatures paralleled maximum outdoor air temperatures. The hops were grown over a trellis, shading the trailer on the east, west, south, and top. The cooling effect increased with the growth of the vines as indicated. By visual inspection partial growth let scattered sun filter in. Full shade eliminated it.

Line 9. West shade, over a lawn area, permitted heating during the morning but provided afternoon protection, thus producing relatively comfortable afternoon conditions despite an exposure to the morning sun.

Line 10. Full tree shade, over lawn, was the most effective natural environment, yielding inside temperatures substantially below the outdoor maximum. This device alone would be satisfactory in producing comfortable conditions except during the very few hottest days each summer.

Artificial Shades:

Line 4. A canvas umbrella roof, having a treated dark color, was suspended 18 inches above the trailer roof. This lowered the asphalt shingle roof temperature about 45°, because of the elimination of direct solar radiation.

Line 5. When the same *canvas roof was whitewashed* on its top surface, a slight improvement in room cooling was observed, caused by increasing the reflectivity of the top canvas surface and thus reducing the temperature rise of the canvas.

Line 6. Canvas awnings, installed over all windows, improved the interior as noted. These results are not included in chart 2 but were included in chart 7 of reference 3 as one of several methods of screening windows against solar radiation. Since awnings are also a shading device, shading changing portions of walls as well as glass, the results are equally appropriate in this comparison.

Line 7. A coat of white paint on the surface of the roof is in effect a shading device because it reflects a portion of the solar radiation, thus limiting the quantity absorbed by roof materials and transferred through roof construction. Its effect is similar to that of the whitewashed canvas shade.

Summary

Results of these experiments indicate that sub-

stantial cooling effects can be attained in hot weather by the proper use of plant materials or artificial materials when they are placed so as to provide effective shade. These results were obtained in a climate which is relatively cloudless and dry with high radiation gains. Shading devices are relatively more effective in these circumstances because they get at the principal source of heat gain and because the low humidity allows higher air temperatures within the comfort zone.

V. Temperature Control with Cooling Devices

Richard D. Cramer and L. W. Neubauer

This report is the fifth in the Davis series. It describes experimental results obtained while using a cottage-type house trailer to survey methods for the alleviation of excessive summer heat in hot, dry climates. One of the possibilities—the use of mechanical cooling devices—is explored herein. Details of instrumentation are contained in references *1*, *2*, and *3*.

Introduction

A number of mechanical methods for cooling have been used in the trailer. The first two to be described were designed to counteract heat gains through the roof. Of these the first is a metal pan at the ceiling which contains water and acts as a heat sink; that is, it absorbs heat from the room air by convection and from its walls and floor by radiation. The second method utilizes sprays which cool the outside surface of the asphalt shingle roof.

Method number three relies on the more conventional system of cooling the room air with a stock refrigerated cooling unit, and method four accomplishes the same result using a stock evaporative unit.

Three of the methods are evaporative and require water which is scarce in many areas where hot, dry climates are experienced. When it is used for cooling, therefore, it should be used effectively. No exact information is available on quantities of water used by the three systems, but those for the ceiling pan and the evaporative cooler are negligible. In theory the same can be said for roof sprays, but in practice recirculation would require an elaborate installation, and spray loss to breezes would be difficult to control.

During all of these experiments the trailer was fully exposed to the sun. Only typically hot and clear July and August days were used in the averages. The ground underneath was asphalt pavement for the ceiling pan runs and bare soil for the others. Previous experimental work had indicated that these two locations are equivalent in terms of the thermal behavior of the room air in the trailer.

Ceiling pan. The pan itself was shallow, made of galvanized iron, and suspended just below the wood ceiling. Its area occupied 40 per cent of the ceiling surface. It was entirely closed off from the room so that outside air was circulated through it. As a result, room absolute humidity was not affected.

During operation a thin layer of water covered the bottom of the pan. A variable-speed electric motor operating a squirrel-cage blower forced outside air across the surface of the water, cooling

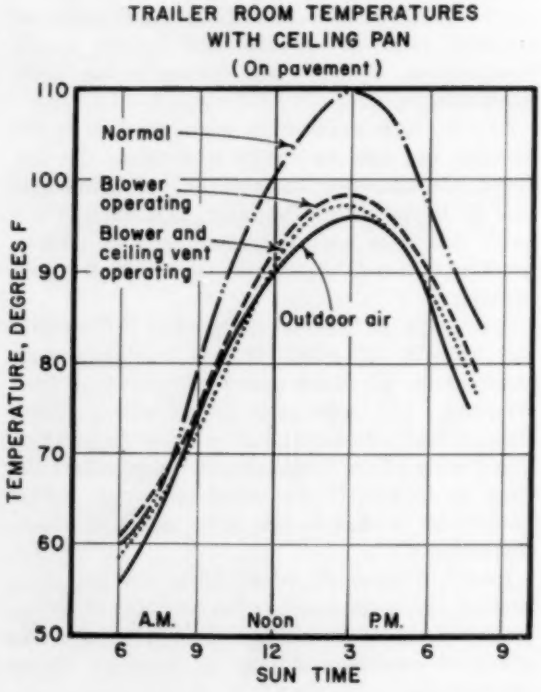


CHART 4. The trailer was parked on asphalt paving, exposed to the sun. The curve marked "Normal" represents air temperatures inside while no efforts were made to counteract heat gain.

both the air and the water by evaporation. Maximum speeds were used, that is, speeds just below the point at which the air velocity caused splashing of the water. At first the air was exhausted to the outside as shown in chart 4 on the curve marked "blower operating." Subsequently, to take greater advantage of the cooled air, it was recirculated through the attic space as shown in the curve marked "blower and ceiling vent operating."

Roof sprays. Initially, the asphalt shingles on the trailer roof were gray-green in hue and rather dark in value. After a number of investigations using the original color, the shingles were painted flat white. Runs were conducted both with and without water sprays. Then the shingles were repainted—this time matte black—and again runs were conducted both with and without sprays. As had been suspected from visual inspection, the original gray-green color was more nearly thermal black than thermal white.

A pipe was placed along the ridge with three nozzles set at quarter points. These were adjusted to give a flat cone of fine spray which covered the roof surface and kept it wet. It was difficult to control the water supply to provide just the right amount to compensate for evaporation. At times some dripped down the sides of the trailer, but the quantity was insufficient to affect interior air temperatures by altering heat gains through walls.

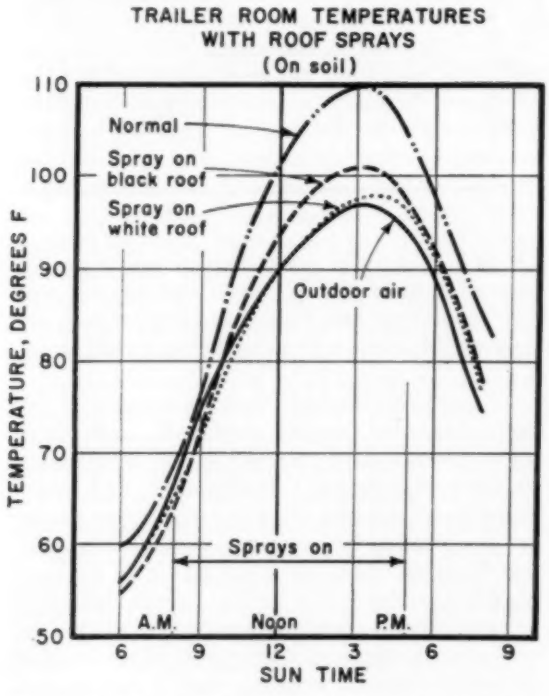


CHART 5. The trailer was parked on plowed earth, exposed to the sun. The curve marked "Normal" represents air temperatures inside while no efforts were made to counteract heat gain.

The effect on the room temperature of the white roof when used dry is indicated in table 1 of preceding part IV. Its maximum is about eight degrees cooler than that of the original, nearly black roof. Chart 5 shows the effect of roof sprays. The addition of sprays cooled the room another four degrees, suggesting that their use on a white roof is of questionable value. In the case of the black roof, the addition of sprays cooled the room about 9 degrees. It would seem therefore that, with a black roof, there is little to choose between painting its surface white and adding sprays. There may, however, be a maintenance problem in retaining the whiteness of the surface.

Summary: Roof methods. It is apparent that the ceiling pan and roof sprays were about equally effective. Both cooled the room air to a point nearly equal to the temperature of the outside air. Both had an effect much like that of the hop vine shade reported in line 8, table 1, of part IV.

One can speculate that the ceiling pan's efficiency could be improved by increasing its area—ideally by covering the entire ceiling. It is doubtful whether this would result in a substantial improvement in a light, uninsulated structure like the trailer, but it is probable that it would in a structure which is well insulated.

The ceiling pan had another advantage which was observed subjectively. Its negative radiant effect increased the feeling of comfort to an extent greater than the air temperature indicated. It behaved in a manner opposite from that of a radiant heat panel. The heating panel can create conditions of comfort by direct radiant gains to occupants in relatively low air temperatures. The cooling panel can create conditions of comfort by direct radiant loss from occupants in relatively high air temperatures.

Refrigerated cooler. This equipment was a standard 3/4 hp model, air cooled, 14.5 amps, with a 1/9 hp fan. It was mounted in a window and was adjusted to use 100 per cent recirculated air. The weather at the time was hot and dry, comparable to the days used for the evaporative cooler runs. Room air temperatures were somewhat higher than those for the evaporative cooler. Room absolute humidities were, of course, unchanged from the "normal" condition.

During another series of cooler days (dry bulb

85° to 90°F) records for refrigerated cooler operation during midday hours show room temperatures markedly lower. These are plotted on the partial curve in chart 6.

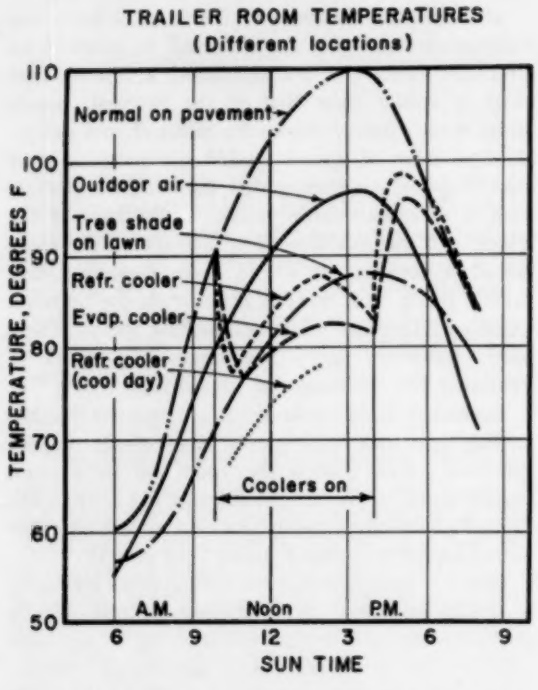


CHART 6. The trailer was parked on asphalt paving, exposed to the sun, during the refrigerated and evaporative cooler runs. It was parked on a grassy turf and completely shaded during the run marked "Tree shade on lawn."

Evaporative cooler. The equipment used was a standard model involving the passage of air through a filter saturated with water. It is rated at 1700 CFM, 2.0 amps, and has a 1/10 hp motor and an 8 x 8 inch blower wheel. It was mounted in a window in the conventional way and used 100 per cent outdoor air which was blown into the room and exhausted through a second open window. It was operated on clear, dry days when the dry bulb reached 100°F and the relative humidity 20 per cent, a situation under which it approaches maximum effectiveness. Under these circumstances it created comfortable conditions in the trailer without undue humidity or draft.

Subsequently the evaporative cooler was remounted to use 100 per cent recirculated air while the room was in its normal, tightly closed condition. The negative results were anticipated and are shown in chart 7 because cooling attempts of this type are often practiced. Since the run was performed while the umbrella roof was mounted, the degree of improvement is evident from a comparison of the recirculating cooler and canvas roof curves. Temperature decrease is almost negligible and occurs only during the morning when it is least needed. The humidity curve describes conditions which were assessed as uninhabitable by subjective reports.

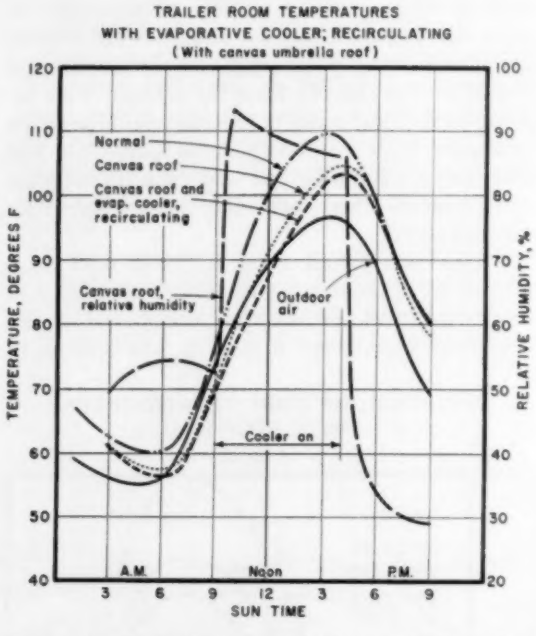


CHART 7. The trailer was parked on asphalt paving, exposed to the sun. The canvas roof was mounted over the shingle roof, leaving an air space between, open on the sides for free circulation of outdoor air.

Summary: Air methods. Both the evaporative and the refrigerated coolers produced results more successful than those achieved by the roof methods. Each has one particular disadvantage. The evaporative cooler operates at maximum efficiency during hot dry weather but raises relative humidity moderately as the room air is cooled. This produces conditions under which comfort is more difficult to achieve. The air-cooled refrigerated cooler operates at maximum efficiency during cool weather and at somewhat reduced efficiency during hot weather but is not affected by outdoor humidity and does not affect room humidity. Both share a characteristic of mechanical systems—larger installations can be provided to improve performance.

In comparison with the curve representing full shade on lawn in chart 6, the results of both air coolers were about the same: the evaporative a little lower, and the refrigerated a little higher. Both had an advantage over full shade in that the evening cooling lag could be eliminated.

Application

These experiments have been performed under but one kind of climate, using but one kind of construction. The climate is generally encountered in many parts of the Southwest and the construction is prevalent in that area. The results, therefore, should be significant for substantial numbers of people. The experience gained can and does offer suggestions about other climates and other constructions, but it cannot be applied thereto without interpretation.

VI. Temperature Control Practices

Richard D. Cramer and Virginia Gould Kay

This sixth report in the Davis series describes the summer heat control experiences of occupants of rural houses in central California. The findings tend to validate many of the experimental results reported in parts I through III (references *1*, *2*, and *3*) and in preceding Parts IV and V.

Introduction

During the summer of 1955 a portion of the University of California project was devoted to the collection of data about summer cooling problems by visits to rural houses and interviews with their occupants. Interviews were conducted, with the assistance of three trained student helpers, from July 8 to August 31 between the hours of 1:45 P.M. and 4:30 P.M. (PDT) on days when the outside dry bulb temperature rose above 90°F. Three hundred fifty-three rural houses in Yolo and Solano Counties were visited in the vicinities of Davis, Dixon, Vacaville, Winters, and Woodland, all within the California Central Valleys area. The summer climate in this area is hot, dry, and clear. Forty-year records for July give a maximum daily temperature average of 95.3°F; a mean of 74.6; a minimum of 54.1. Figures for August are slightly lower: 94.0, 73.1, and 52.5, respectively. The average summer day has a rapid morning rise and a rapid evening decline accompanied by southerly breezes. The 24-hour spread and the relatively cloudless nights facilitate nocturnal cooling. The results that follow were experienced under these climatic conditions. They cannot be transferred, without interpretation, to locations which differ climatically.

Methodology

County maps were used to locate the houses. If occupants were away or did not wish to participate, the houses were discarded from the sample. In general, the co-operation was excellent.

Information was recorded by the interviewer on a questionnaire. It was obtained: (1) by direct observation (planting, materials, colors), (2) by measurement (temperature and humidity), and (3) by occupant answers (insulation and the size and age of the house). In most cases, the occupant providing the answers was the homemaker. The measurements of temperature and humidity were taken in the living room using a sling psychrometer.

To analyze the data, charts were made locating the houses on co-ordinates of outside and inside dry bulb temperature. Each house was described by a code of 33 letters and numbers containing all the pertinent information in the questionnaire. Colored pins were used to designate particular samples. By this visual method, patterns of consistency could be perceived. These were read from the chart, recorded, and averaged.

Sample

At first, generalized data were noted; for example, about 60 per cent of the occupants were engaged in agricultural occupations and about 40 per cent in a wide variety of other professions and trades. But regardless of occupation, a widespread consciousness of summer heat was indicated by the range of living room colors. Fifty per cent used greens and blues and gave psychological coolness as a factor in their choice.

The ages of the houses varied from 1 to 150 years, but only 3 were more than 100 years old. The largest single group was built within the last 5 years; the median age was 7 years. In size they varied from 1 to 13 rooms with the largest single group having 5; the median was 6.

Variations of temperature and humidity en-

countered are listed in table 2 along with the average conditions for all houses in the sample.

TABLE 2

Temperature and humidity

TEMPERATURE AND HUMIDITY	VARIATION	AVERAGE
1. Inside dry bulb	73 to 103°F	85.4°F
2. Outside dry bulb	88 to 107°F	95.2°F
3. Inside relative humidity	19 to 75 per cent	40.1 per cent
4. Outside relative humidity	10 to 32 per cent	21.8 per cent

Results

It was decided at the outset that the temperature difference, that is, *Outside Dry Bulb minus Inside Dry Bulb*, consistently could be used as a measure of the thermal effectiveness of a house. Tables 3 to 6 list, by groups, average temperature differences for all houses visited (column A). Because of the substantial variation in the outside dry bulb, all houses visited when it read 95°F or higher are tabulated separately (column B) on the assumption that occupants use houses (keep them closed and shaded and operate cooling devices) to maximum advantage in the hottest weather. Numbers in parentheses indicate the numbers of houses in the samples.

Insulation information was tabulated as reported by the occupants. Of the 153 houses insulated, 97 reported ceiling insulation only, 56 ceilings and walls. These two groups averaged 10.7°F temperature difference separately as well as when taken together. Fifty-three were uncertain as to whether their houses were insulated and so were not listed. In general these were renters rather than owners. No information was taken as to the kind of insulation, the quantity, or the details of installation.

Information was not included as to whether coolers were operating at the time of the interview or for how long or during what hours they had been operating. Information as to capacity or details of installation of either the refrigerated or evaporative types is not available.

Concepts of comfort commonly interrelate temperature and humidity. The only group in which humidity varied from the norm was the evaporative cooler group. These results are given in table 7. The slight variations in lines 1 and 3 are chance. The more substantial variations in lines 2 and 4 are indications of the humidifying effects of evaporative coolers.

TABLE 3

Number of stories

STORIES	TEMPERATURE DIFFERENCE	
	A	B
1. All houses	(353) 9.8°F	(170) 11.8°F
2. All 1-story houses	(295) 9.4°F	(140) 11.2°F
3. All multi-story houses	(58) 12.0°F	(30) 14.7°F
1½-story	(21) 11.5°F	
2-story	(37) 12.2°F	

TABLE 4

Plant material

SHADE	TEMPERATURE DIFFERENCE	
	A	B
1. All houses with no shade	(70) 7.5°F	(36) 9.6°F
2. All houses with partial shade	(170) 8.8°F	(79) 11.7°F
3. All houses with complete shade	(113) 10.9°F	(57) 13.4°F

Analyses

Variations encountered in the averages listed in tables 3, 4, 5, and 6 were examined. The spread of the temperature difference distribution suggests that comfortable indoor temperatures are the result of rather different combinations of variables. With this in mind, further analyses were made, first eliminating the characteristics which seemed not to contribute and subsequently focusing on those which did.

TABLE 5

Insulation

INSULATION	TEMPERATURE DIFFERENCE	
	A	B
1. All non-insulated houses	(147) 8.5°F	(73) 10.6°F
2. All insulated houses	(153) 10.7°F	(80) 13.0°F

Characteristics which demonstrated no discernible influence were geographic location within the over-all area, basements or cellars, wall and roof materials and colors, amounts and orientations

TABLE 6

Mechanical cooling

COOLERS	TEMPERATURE DIFFERENCE	
	A	B
1. All houses with no coolers	(223) 8.7°F	(100) 11.0°F
2. All houses with evaporative coolers	(124) 11.7°F	(66) 13.3°F
3. All houses with refrigerated coolers	(6) 13.3°F	

of glass, window coverings, floor construction and covering, and overhang.

TABLE 7

Humidity

HUMIDITY	ALL HOUSES	WITH EVAPORATIVE COOLER	WITH NO COOLER
	per cent	*per cent*	*per cent*
ALL HOUSES VISITED			
1. Relative humidity outside	21.8	21.4	22.0
2. Relative humidity inside	40.1	42.7	38.8
ALL HOUSES VISITED WHEN THE OUTSIDE DRY BULB READ 95° OR HIGHER			
3. Relative humidity outside	19.1	19.9	18.7
4. Relative humidity inside	39.9	44.4	37.3

Since the area is relatively homogeneous, the absence of locational variation was not surprising—neither was the lack of influence of a basement or cellar in view of accepted methods of summer heat gain calculation.

Nearly all of the houses were wood frame. Insufficient numbers of white or aluminum roof surfaces or of concrete masonry walls or concrete floor slabs were encountered to constitute suitable samples, and so the effects of these variables could not be examined.

Consistently, the buildings had limited quantities of glass. No "solar houses" were included; some "picture windows" were, but not in significant numbers when those on sheltered or shaded exposures were subtracted. A variety of conditions of room arrangement, orientation, partial shade, porch roofs, overhangs, and glass quantities and coverings rendered impossible the selection of a consistent sample based on orientation, overhang, or glass quantity.

Among the factors which seemed significant, the time of the interview exerted a slight influence as illustrated by the fact that for all houses visited before 3 P.M. the temperature difference averaged 10.4°F, while for those visited after 3 P.M. the average was 9.0°F. One would expect that as the outside temperature reached its peak and began to decline, the lag in the rise of the inside temperature would tend to narrow the difference between the two.

Other than time, factors which seemed to exert the greatest influence were: (1) number of stories, (2) shade, (3) insulation, and (4) mechanical cooling. In order to evaluate their independent contributions, a system was used to examine each separately, free from the influences of the others. First, all houses about which complete information in these four categories was lacking were discarded. Second, all houses which had inoperative evaporative coolers were discarded. Third, all houses with partial shade were discarded. Fourth, houses with ceiling insulation were combined with those with ceiling and wall insulation to form one group. Fifth, houses with refrigerated coolers were discarded because the sample was inadequate.

Those remaining were tabulated in the groups listed in table 8. When compared with that of the total sample, their performance was found to be typical. The symbols in column A are defined as follows:

First letter: S = full shade; O = no shade
Second letter: I = insulation; O = no insulation
Third letter: C = evaporative cooler; O = no cooler

Again the numbers in parentheses indicate the numbers of houses in each sample.

TABLE 8

Selected sample

A	ALL TEMPERATURES		OUTSIDE DRY BULB 95°F AND HIGHER	
	B—ONE STORY	C—MULTI-STORY	D—ONE STORY	E—MULTI-STORY
	Temperature difference		Temperature difference	
1—S+I+C	(9) 12.9°F	(2) 16.0°F	(7) 14.6°F	(2) 16.0°F
2—S+O+C	(14) 13.2°F	(0) ——	(10) 15.5°F	(0) ——
3—S+I+O	(13) 11.5°F	(8) 14.0°F	(7) 12.7°F	(3) 16.0°F
4—O+I+C	(7) 13.4°F	(0) ——	(6) 14.0°F	(0) ——
5—S+O+O	(24) 9.3°F	(17) 12.7°F	(10) 12.1°F	(8) 15.6°F
6—O+O+C	(6) 9.3°F	(0) ——	(3) 10.3°F	(0) ——
7—O+I+O	(21) 9.3°F	(0) ——	(10) 11.9°F	(0) ——
8—O+O+O	(12) 3.5°F	(0) ——	(6) 4.5°F	(0) ——

Conclusions

It is apparent that multi-story houses are consistently cooler than those having but one story. By analysis of comparable lines in columns B and C, the superiority of multi-story houses varies from 2.5°F to 3.4°F and averages 2.7°F. This compares accurately with the figure 2.6°F derived from column A of table 3. Similarly columns D and E reveal a multi-story advantage of 2.7°F compared with 3.5°F in column B of table 3.

It is also indicated that a system of diminishing returns is at work. For the houses in line 8, substantial benefit will be derived by the addition of any one item: shade, insulation, or a cooler. The three seem to be about equally effective when used independently. Somewhat reduced benefits accompany the addition of the second, and apparently none at all the addition of the third.

Again beginning with a house in line 8, if it has one story, and any two items are to be added, shade plus a cooler, or insulation plus a cooler are about equally effective. Shade plus insulation is less effective, presumably because shade reduces the temperatures of outside surfaces and thereby renders insulation less useful.

In the case of multi-story houses, column E suggests that shade alone is sufficient. Column C does not entirely agree, but indications are that in multi-story houses the addition of insulation and/or coolers is less effective than in one-story houses. It must be remembered that the inside temperatures used were those in the living room on the first floor.

A comparison of columns B and D suggests that in the hottest weather the effectiveness of shade is increased. Presumably this results from the fact that the hottest days are the clearest days with maximum radiation values, a situation which shade can best combat.

Because of the few small samples of multi-story houses, a group containing substantial numbers of them and having moderate shade was averaged as follows. The results substantiate those previously indicated.

9 — M+O+O (34) 6.6 (13) 10.1 (17) 8.1 (7) 12.1

Two variables must be considered when evaluating the results. The first is that no attempt has been made to ascertain the quality of insulation or of evaporative cooler installations; therefore, the figures indicate not what is possible with the use of these items but what people actually were experiencing with their use (and perhaps misuse). The second variable involves occupant behavior in terms of the degree of openness or closure, and of the prevalence of activities which produce heat and/or humidity, such as cooking, laundering, or canning.

The distribution of temperature differences emphasizes the importance of variables of which occupant behavior seems to be the most significant. Here is a typical distribution, the one for the 17 houses in table 8, column C, line 5:

TEMPERATURE DIFFERENCE (°F)		NUMBER OF HOUSES
22		1
19		1
17		1
16		1
14		3
13	Median = 13	3
12		1
10		2
9		1
8		1
7		1
5		1

While the majority of houses cluster around the 13° figure, it seems possible to do as "well" as 22° or as "poorly" as 5°. The 22° example was tightly barricaded and the 5° example quite open.

Barricading during the hot part of the day was commonly reported as the only means employed to resist overheating, particularly on the part of occupants of the larger older houses. With tendencies toward reduced floor area and lower ceilings, this method becomes increasingly difficult, suggesting that some other solution may be called for in smaller houses.

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1. Part I. Description of the mobile housing unit and methodology, pp. 161-163.
2. Part II. Preliminary studies of the value of plant materials in regulating room air temperature, pp. 163-164.
3. Part III. Effect of certain home furnishings on room temperature, pp. 165-167.

International Council of Women

The National Council of Women of the United States, the U.S. affiliate of the International Council of Women, has announced the program of work formulated by the standing committee on home economics for 1957-1960. Some of the activities proposed are: To continue to work for consumer protection by forming consumer associations in all countries and by circulating consumer literature. To continue to co-operate with other agencies by circulating the latest nutrition information and spreading knowledge of correct diet among all countries. To continue to secure more leisure for the housewife to enable her to take part in public life through furthering homemaking training for boys and girls and adults. To help the aged, infirm, and handicapped maintain economic independence. Mrs. Dora S. Lewis, a former AHEA president, is chairman of the NCW standing committee on home economics.

Persons planning wall coverings that will withstand certain types of wear in institution use as well as in homes will find helpful data in this report of a study of fabric-backed wall coverings.

Serviceability of Fabric-backed, Plastic-coated Wall Coverings

Esther Fern Rupel

Miss Rupel is an instructor in the clothing and textiles department in the School of Home Economics at Purdue University. The research reported in this article was part of her work for a master's degree at the same University.

THIS study consisted of testing selected fabric-backed, plastic-coated wall coverings for serviceability. It sought to determine the best buy for home and institutional use; to determine whether the coverings tested fulfilled recommendations for their use in schools, homes, hospitals, and public buildings for lounges, dining rooms, service areas, stairways, and corridors; and to determine whether they fulfilled the claims of the manufacturers, namely, a high resistance to abrasion, scuffs, scratches, aging, flame, fading, acids and alkalies, soil, stains, discoloration; easy care; and suitability for plaster or dry walls. The serviceability of light colors and dark colors and of smooth, embossed, and highly embossed textures were compared.

Thirty samples of plastic-coated wall coverings from five different companies were tested. They ranged in color from light to dark, in texture from smooth to embossed and highly embossed, from light to heavy fabric backing, and were either plastic coated or vinyl plastic coated. Samples were hung professionally on a plaster wall using wheat starch paste and a recommended adhesive. After 16 weeks they were rated for eye appeal, adhesion to the wall, the amount of soil, and the removal of the soil by washing. The stability of color was tested by using standard test methods for resistance to fading, crocking, acids, and alkalies. The effect of deterioration was determined by the breaking strength before and after aging and was visually rated for any embrittlement, discoloration, and fading. Tests for fire resistance were made with the glowing end of a cigarette, flame in contact with samples mounted on a piece of plaster wall, and flame in contact with the lower cut edge of a vertically mounted sample. Wear tests were performed using the Taber Abraser, the Accelerotor, and a nail file. Soiled samples were washed to determine the best method of soil removal. Test samples were treated for the removal of selected stains, namely, chocolate sirup, a carbonated beverage, coffee, milk, orange juice, wax crayon, washable blue ink, and ball-point pen ink. The width, length of roll, weight per square yard, and cost per lineal yard of the fabrics were evaluated.

Findings

The study showed that the majority of the vinyl plastic-coated wall coverings did live up to the general claims of the manufacturers, that they would be satisfactory for use in schools, homes, hospitals, and public buildings for lounges, dining rooms, service areas, stairways, and corridors. All test samples were satisfactorily hung with the recommended adhesive and withstood the presence of moisture and heat. Wall imperfections were less evident with the use of embossed or highly embossed textures of plastic-coated wall coverings than with smooth textures. Some of the fabrics could be hung nonprofessionally; but for large quantities, hanging faults would be minimized by the use of a special team of professional hangers. The dark-colored samples showed less sign of soil than did the light-colored wall coverings. Soil from all samples was easily and satisfactorily removed, and the samples appeared to be the same as the original control samples.

In this study the embossed vinyl plastic-coated wall coverings resisted abrasion better than did the highly embossed, and the vinyl plastic-coated samples resisted wear better than did the plastic coated. Eight samples showed no loss of color or texture when tested for 5,000 cycles on the Taber Abraser under CS-17 Calibrase wheels under

a 1,000-gram weight; 15 showed the removal of surface color without loss of texture; and 6 showed porosity, fabric backing, or a hole. A similar pattern of wear appeared on the test samples abraded by the Accelerotor and the nail file. None of the samples showed discoloration, embrittlement, or loss of grain from accelerated aging at 212° Fahrenheit for five hours; but all samples showed a marked per cent loss of breaking strength.

Nineteen and 27 test samples showed excellent color retention in the presence of acids and alkalies, respectively; 24 showed no appreciable color fading after 160 hours' exposure in the Fade-Ometer; and the color was readily removed from the white test cloths, with the exception of one, from the 16 samples that crocked.

Five samples were found to be fire-resistant to the vertical flame test, being self-extinguishing with no afterglow; the remaining were not self-extinguishing, and the majority burned with a rapid flame. All the plastic-coated wall coverings tested in this study were fire-resistant when tested for flammability on the wall. Only one sample showed an obvious sign of burn when subjected to the glowing end of a cigarette for twelve seconds.

Six stains—chocolate sirup, carbonated beverage, coffee, milk, orange juice, and washable blue ink—were satisfactorily removed from all test samples. Wax crayon and ball-point pen ink were more difficult to remove. Twenty-four test samples responded satisfactorily to soil removal with a natural sponge and dry-cleaner's soap, five highly embossed textures were difficult to clean.

The weight in ounces per square yard varied greatly from 24.7 to 8.9, which appeared to be due to the weight and weave of the cotton backing and the amount of plastic coating. The fabric width varied from 24 to 54 inches, and the roll lengths from 3 to 30 yards. The cost per lineal yard varied with quality, weight, width, and manufacturer, the lighter weight being less expensive. Plastic-coated wall coverings had a price range of 9 to 13 cents per square foot. The vinyl plastic-coated samples ranged from 22 cents to 37 cents per square foot. This study showed that the higher priced vinyl plastic-coated wall coverings tested were more serviceable than were the two lower priced plastic-coated samples. The cost of the recommended adhesive used was much higher in price than wheat starch paste. The tests in this study showed that in the long run the initial cost of plastic-coated wall coverings would tend to be offset by the attractive color and texture, high serviceability, and ease of care.

This study showed also that the plastic-coated wall coverings used in this study generated excessive heat when tested in the Accelerotor, making the test specimen too hot to handle. When two open screws, designed with a $\frac{9}{16}$-inch central core hole, were used in place of the solid screws, the test samples could be easily handled upon removal from the test chamber. It is recommended that a set of open screws designed and used for this study on plastic-coated wall coverings be added to the attachments of the Accelerotor.

The Accelerotor test of five minutes at 3,000 revolutions per minute on the plastic-coated wall covering samples appeared to give a comparable edge wear abrasion to that of the 1¼-hour test of 5,000 cycles on the Taber Abraser under 1,000-gram load using CS-17 Calibrase wheels. Further study on plastic-coated fabric might be made to establish a standard on the Accelerotor comparable to the standard wear test on the Taber Abraser.

HEIB Directory Available

A limited number of 1958 HEIB directories are now available. The directory contains the names and addresses of more than 1800 home economists in business grouped according to their states and, in a separate index, alphabetically by name. The business address and title of each member is given along with the classification of her position within the field of home economics, such as: advertising, home service, journalism, public relations, etc. All information in the directory is revised each year. The directory itself is spiral bound for easy handling. AHEA members may purchase the directory for $3 a copy. For non-members of AHEA, the cost is $5. Checks or money orders should be made payable to "Home Economics in Business" and sent to Miss Elspeth Bennett, 33 Narragansett Drive, St. Louis 24, Missouri. Payment and the name and address where the directories are to be mailed must accompany the order. Orders cannot be billed.

Fabric finishes and their effect on the comfort of clothing through their influence on the air permeability of the fabric to which they are applied are the subject of this interesting and timely report.

Effect of Finishes on Air Permeability of Cotton Fabrics[1]

Mary Anna Grimes and Cynthia M. Dillin

Miss Grimes is a professor in the department of home economics of the Texas Agricultural Experiment Station, where she has conducted research in textiles and clothing for 30 years. Mrs. Dillin is a technician in the same department. **The authors gratefully acknowledge the assistance of Ivy Lee Beene in the collection and analysis of the data.**

THE air permeability, or the extent to which air passes through fabrics, is one of the properties which affect the comfort of clothing. Clothing which "breathes" is more comfortable, particularly in hot weather, than clothing through which little air passes.

Anything which is added to a fabric, such as a finish, might be expected to affect the amount of air which passes through. If the added substance closes passages between fibers or yarns through which the air otherwise might pass freely, the fabric breathes less and may become less comfortable. Only under such conditions as a cold strong wind or heavy rain is it desirable to have little air pass through clothing.

Fabrics and Finishes

Thirteen cotton fabrics were used. These included suiting in three colors, three colors of batiste, five colors of percale, one white broadcloth, and one brown denim. Fabrics of the same kind were purchased as being identical except in color.

Four finishes which had been used previously in a serviceability study were used (*1*). These were ordinary laundry starch, a long-lasting resin starch, a plastic starch which contained some carboxymethylcellulose (CMC), and CMC alone. The same concentrations were used as in the serviceability study (*1*). The fabrics were first washed to remove any soluble finishes. The full cycle was run in an automatic washer of the agitator type, with no soap or detergent. The finish was applied, excess was spun out, and the fabrics dried in an electric dryer, then dampened, and ironed with a rotary ironer.

[1] Approved for publication by the Texas Agricultural Experiment Station as Technical Article No. 2771.

Yarns per Inch of Fabric

The number of warp and filling yarns per inch of fabric was counted for each of the 13 fabrics before and after application of each of the finishes (table 1).

Although the same fabric was supposed to be alike in all colors, there were sometimes differences in yarns per inch. For example, there were more filling yarns in white suiting than in green or red. The fillings of the percales differed by as much as four yarns per inch.

For most fabrics, laundering to remove soluble finishes increased the number of yarns per inch in warp and filling, as shown by comparisons of the fabric as purchased with the same fabric with no added finish. This increase in yarns per inch was probably the result of shrinkage. The addition of a finish did not significantly affect the number of yarns per inch.

Air Permeability of Fabrics

The Frazier air permeability instrument was used to measure rate of flow of air in cubic feet per square foot of fabric per minute with the air at 75 ± 2°F and 66 ± 2 per cent relative humidity.

Fifteen determinations were made for each fabric. The areas tested were always at least four inches from the selvage and were spaced to avoid the inclusion of the same yarns. The average of 15 readings was considered the air permeability for that fabric. The air permeability of each of the 13

fabrics with soluble finish removed and after the addition of each finish is given in table 2.

These data show that for each finish there were sometimes wide differences in permeability among different colors of the same type of fabric. These differences cannot be accounted for by differences in number of yarns per inch. For example, the yellow and blue percales had approximately the same number of yarns per inch but differed widely in permeability. Batistes, with approximately the same yarn count in all colors, differed in permeability. Some property other than the number of yarns per inch apparently caused the difference in permeability. Evidently the air permeability of a fabric cannot be estimated by comparing it with a fabric of similar yarn count. Neither yarn size nor twists per inch was determined for these fabrics, nor is it known whether the same type of fabric had the same sizing in all colors or whether laundering removed equal amounts of the original sizing.

The average permeability for no finish and resin were approximately equal as were the averages for starch- and plastic-finished fabrics. The permeability with CMC was much higher than for the other finishes. Individual fabrics differed in response to finishes.

Of the 130 possible comparisons between two finishes, 89 (or 68 per cent) showed statistically

TABLE 2

Air permeability for each fabric without and with finish

FABRIC	CUBIC FEET PER SQUARE FOOT PER MINUTE WITH FINISH INDICATED				
	None	Starch	Plastic	Resin	CMC
Suiting, white	109.0	135.2	138.5	127.5	150.7
Suiting, green	196.3	220.7	222.3	223.0	233.1
Suiting, red	174.5	190.7	189.7	172.0	213.7
Batiste, white	184.9	195.4	213.3	183.3	219.7
Batiste, blue	224.4	221.2	222.7	216.9	232.8
Batiste, pink	248.1	241.6	245.4	232.5	264.8
Percale, white	74.1	66.3	69.7	69.7	81.3
Percale, blue	105.9	111.5	105.5	98.4	132.1
Percale, green	95.1	103.5	102.7	98.2	119.3
Percale, violet	104.6	106.5	101.1	109.9	120.0
Percale, yellow	63.0	60.7	65.3	52.2	74.8
Broadcloth, white	73.1	90.3	84.2	80.7	112.9
Denim, brown	79.3	77.3	69.1	67.5	78.0
Average	133.2	140.1	140.7	133.2	156.4

TABLE 1

Number of yarns per inch for each fabric without and with finish

FABRIC	NUMBER OF YARNS PER INCH WITH FINISH INDICATED					
	As Purchased	None	Starch	Plastic	Resin	CMC
WARP						
Suiting, white	53.4	56.0	55.0	54.7	55.4	55.3
Suiting, green	53.4	55.2	53.6	53.9	53.5	54.6
Suiting, red	53.2	55.6	54.8	54.3	54.6	54.9
Batiste, white	97.5	105.2	104.8	104.7	103.7	103.8
Batiste, blue	97.2	105.0	102.8	105.9	104.0	103.7
Batiste, pink	96.7	104.8	102.8	104.6	103.8	103.8
Percale, white	85.9	89.0	90.5	91.2	90.0	89.2
Percale, blue	86.3	91.6	91.2	92.0	90.7	94.2
Percale, green	87.1	93.5	95.1	95.2	94.5	94.2
Percale, violet	86.3	92.1	92.7	93.7	91.3	92.4
Percale, yellow	86.1	92.2	92.1	90.6	91.9	91.5
Broadcloth, white	121.9	121.7	121.3	121.1	121.5	121.5
Denim, brown	65.2	66.5	67.1	66.7	68.2	67.9
Average	82.3	86.8	86.4	86.8	86.4	86.7
FILLING						
Suiting, white	50.4	50.4	50.1	50.1	49.5	50.8
Suiting, green	42.1	43.5	42.4	42.4	42.1	42.8
Suiting, red	46.1	47.1	46.7	46.2	46.9	45.2
Batiste, white	93.7	97.6	93.8	96.1	94.8	96.4
Batiste, blue	92.0	94.5	93.3	94.2	93.5	93.8
Batiste, pink	92.7	94.2	94.3	95.7	94.8	94.6
Percale, white	73.3	76.1	76.3	76.8	77.2	75.1
Percale, blue	72.1	76.5	76.2	77.2	76.2	74.8
Percale, green	71.0	78.8	73.2	73.8	72.9	73.0
Percale, violet	75.3	80.2	79.5	77.0	78.1	77.7
Percale, yellow	74.1	74.2	76.7	77.2	76.9	77.0
Broadcloth, white	58.7	60.0	59.9	59.8	59.7	58.9
Denim, brown	47.8	46.7	47.2	45.9	47.7	48.1
Average	68.4	70.8	70.0	70.2	70.0	69.9

significant differences between finishes. The t values for each pair are given in table 3. The finish which was more permeable and the degree of significance are given in parentheses.

TABLE 3

*Significance of differences between fabrics and finishes in air permeability**

FABRIC	FINISH	t VALUES FOR DIFFERENCES WITH FINISH INDICATED†			
		Starch	Plastic	Resin	CMC
Suiting, white	None	6.904(S 0.1%)	9.289(P 0.1%)	5.622(R 0.1%)	9.180(C 0.1%)
	Starch		0.922	2.098(S 5%)	3.218(C 1%)
	Plastic			3.641(P 1%)	2.816(C 1%)
	Resin				5.231(C 0.1%)
Suiting, green	None	4.535(S 0.1%)	4.688(P 0.1%)	5.140(R 0.1%)	6.923(C 0.1%)
	Starch		0.307	0.470	2.498(C 2%)
	Plastic			0.134	2.100(C 5%)
	Resin				2.130(C 5%)
Suiting, red	None	2.413(S 5%)	3.293(P 1%)	0.583	9.238(C 0.1%)
	Starch		0.142	2.707(S 2%)	3.333(C 1%)
	Plastic			3.999(P 0.1%)	5.426(C 0.1%)
	Resin				10.348(C 0.1%)
Batiste, white	None	2.039(S 5%)	5.816(P 0.1%)	0.301	5.200(C 0.1%)
	Starch		4.459(P 0.1%)	2.756(S 2%)	3.994(C 0.1%)
	Plastic			7.222(P 0.1%)	1.092
	Resin				5.891(C 0.1%)
Batiste, blue	None	0.674	0.304	1.488	1.802
	Starch		0.313	0.987	2.959(C 1%)
	Plastic			1.130	2.099(C 5%)
	Resin				3.712(C 0.1%)
Batiste, pink	None	1.603	0.526	2.756(N 2%)	3.689(C 0.1%)
	Starch		0.758	1.654	5.377(C 0.1%)
	Plastic			2.204	3.605(C 1%)
	Resin				5.520(C 0.1%)
Percale, white	None	2.989(N 1%)	1.397	1.595	2.474(C 2%)
	Starch		1.290	1.498	6.119(C 0.1%)
	Plastic			0.021	3.880(C 0.1%)
	Resin				4.445(C 0.1%)
Percale, blue	None	2.250(N 5%)	0.186	3.268(N 1%)	8.417(C 0.1%)
	Starch		2.405(P 5%)	4.988(S 0.1%)	6.085(C 0.1%)
	Plastic			3.087(P 1%)	8.537(C 0.1%)
	Resin				10.497(C 0.1%)
Percale, green	None	3.115(S 1%)	2.713(P 2%)	0.987	9.150(C 0.1%)
	Starch		0.288	1.673	6.038(C 0.1%)
	Plastic			1.377	6.076(C 0.1%)
	Resin				6.778(C 0.1%)
Percale, violet	None	0.772	1.262	1.879	5.825(C 0.1%)
	Starch		2.388(S 5%)	1.525	6.687(C 0.1%)
	Plastic			3.295(R 1%)	7.527(C 0.1%)
	Resin				4.104(C 0.1%)
Percale, yellow	None	1.746	1.297	6.036(N 0.1%)	7.738(C 0.1%)
	Starch		2.647(P 2%)	4.858(S 0.1%)	9.472(C 0.1%)
	Plastic			6.193(P 0.1%)	5.038(C 0.1%)
	Resin				11.720(C 0.1%)
Broadcloth, white	None	6.818(S 0.1%)	5.214(P 0.1%)	2.032	12.799(C 0.1%)
	Starch		2.661(S 2%)	2.530(S 2%)	6.976(C 0.1%)
	Plastic			0.971	13.144(C 0.1%)
	Resin				7.610(C 0.1%)
Denim, brown	None	0.860	5.711(N 0.1%)	5.808(N 0.1%)	0.520
	Starch		4.498(S 0.1%)	4.749(S 0.1%)	0.270
	Plastic			1.030	4.331(C 0.1%)
	Resin				4.662(C 0.1%)

* To be significant at the 5 per cent level t must be at least 2.048.
To be significant at the 2 per cent level t must be at least 2.467.
To be significant at the 1 per cent level t must be at least 2.763.
To be significant at the 0.1 per cent level t must be at least 3.674.
† The fabric which is more permeable and the significance of the t value are given in parentheses.

Effect of Starch on Permeability

The average permeability was slightly increased over the control or unfinished fabric when starch was added. However, fabrics differed in their response to starch. In six of the 13 fabrics starch significantly increased the permeability, but in two percales the permeability was greater without starch. In the five other fabrics the differences in permeability were not significant.

Three fabrics with starch were more permeable than those with plastic finish, but four fabrics were less permeable. The differences between starch and plastic were not significant for six fabrics.

Comparisons between fabrics with starch and resin show that seven were more permeable with starch, but the differences were not significant for six fabrics.

The 13 fabrics were more permeable with CMC than with starch, and in all cases but one the differences were highly significant.

Effect of Plastic Starch on Permeability

In six fabrics the plastic starch containing CMC increased the permeability over the same fabric without finish. In one case, the denim, the fabric was more permeable without the plastic finish, and in six cases the finish had no significant effect.

In three fabrics the permeability was higher for the plastic finish than for the starch; in three fabrics it was lower; but the differences were not significant for seven fabrics.

For five fabrics the permeability was higher for plastic than for resin, and in one case it was lower. There was no significant difference between plastic and resin for seven fabrics.

Effect of Resin on Permeability

Resin increased the permeability of only two fabrics over the controls, decreased it for four, and made no significant difference in seven of the 13 fabrics.

TABLE 4

*Significance of difference in width of spaces between warp yarns for each finish**

FABRIC	FINISH	t VALUES FOR DIFFERENCES WITH FINISH INDICATED†			
		Starch	Plastic	Resin	CMC
Suiting, white	None	3.424(N 0.1%)	1.758	5.789(N 0.1%)	5.476(C 0.1%)
	Starch		2.132(S 5%)	3.721(S 0.1%)	1.095
	Plastic			5.405(P 0.1%)	7.474(C 0.1%)
	Resin				1.072
Suiting, green	None				11.556(C 0.1%)
Suiting, red	None	1.395			3.374(C 0.1%)
	Starch				1.789
Batiste, white	None		3.772(N 0.1%)		4.225(N 0.1%)
	Plastic				0.495
Batiste, blue	None			3.261(R 1%)	0.547
	Resin				2.904(R 1%)
Batiste, pink	None			0.537	0.571
	Resin				0.0
Percale, white	None	5.514(S 0.1%)			8.301(C 0.1%)
	Starch				2.157(C 5%)
Percale, blue	None	6.038(N 0.1%)	7.354(N 0.1%)	3.142(N 1%)	0.914
	Starch		0.189	2.748(R 1%)	4.386(C 0.1%)
	Plastic			3.338(R 1%)	5.117(C 0.1%)
	Resin				1.840
Percale, green	None				6.545(C 0.1%)
Percale, violet	None				0.796
Percale, yellow	None	1.064	9.052(P 0.1%)	4.109(R 0.1%)	5.848(C 0.1%)
	Starch		9.631(P 0.1%)	2.878(R 1%)	6.600(C 0.1%)
	Plastic			4.785(P 0.1%)	3.450(P 0.1%)
	Resin				1.515

* To be significant at the 5 per cent level t must be at least 1.979.
To be significant at the 1 per cent level t must be at least 2.616.
To be significant at the 0.1 per cent level t must be at least 3.373.
† The significance of the t value and the wider space of the fabrics are given in parentheses.

Only in the violet percale did resin increase permeability above another finish. In this fabric the resin finish resulted in higher permeability than did the plastic. In all other fabrics the differences between resin and all finishes but CMC were not statistically significant. In all cases CMC was much more permeable than resin.

Effect of CMC on Permeability

In all but four of the 52 comparisons of CMC, with the fabric without finish and with another finish, the CMC-treated fabric was more permeable. Thus, CMC increased significantly the permeability of 13 fabrics over that of four other finishes in 92 per cent of the comparisons. In four cases the differences were not significant. In 38 of these 48 comparisons the difference was statistically significant at the 0.1 per cent level or above (table 3).

Width of Yarns and of Spaces between Yarns

If the application of a finish made the yarn more compact and increased the space between the yarns, the air permeability presumably would be affected. To see whether this occurred, measurements were made of the width of the yarns and of the spaces between the yarns in the warp and filling directions for some of the fabrics and finishes. Measurements were made with a Filar micrometer mounted on a microscope. The considerable time required for making measurements made necessary the selection of only a portion of the fabrics and finishes. The t values were calculated to determine whether there was a significant difference between two fabrics in the width of the yarn and of spaces between the yarns. The t values for the width of the spaces between warp yarns and between filling yarns are given in tables 4 and 5.

Observation of width of spaces and air permeability in tables 2, 4, and 5 shows that, in most cases, the differences in permeability can be explained by differences in the width of spaces between either or both the filling and warp yarns. To illustrate:

TABLE 5

*Significance of difference in width of spaces between filling yarns for each finish**

FABRIC	FINISH	t VALUES FOR DIFFERENCES WITH FINISH INDICATED†			
		Starch	Plastic	Resin	CMC
Suiting, white	None	5.634(S 0.1%)	8.303(P 0.1%)	4.568(R 0.1%)	6.951(C 0.1%)
	Starch		4.517(P 0.1%)	5.103(S 0.1%)	3.712(C 0.1%)
	Plastic			5.938(P 0.1%)	1.139
	Resin				4.540(C 0.1%)
Suiting, green	None				5.540(C 0.1%)
Suiting, red	None	0.473			0.365
	Starch				0.168
Batiste, white	None		0.0		0.470
	Plastic				0.481
Batiste, blue	None			1.035	0.0
	Resin				1.364
Batiste, pink	None			1.473	0.472
	Resin				1.035
Percale, white	None	4.358(S 0.1%)			10.106(C 0.1%)
	Starch				6.186(C 0.1%)
Percale, blue	None	15.343(N 0.1%)	0.487	0.169	6.341(C 0.1%)
	Starch		17.143(P 0.1%)	17.629(R 0.1%)	5.428(C 0.1%)
	Plastic			0.364	6.225(C 0.1%)
	Resin				6.697(C 0.1%)
Percale, green	None				7.159(C 0.1%)
Percale, violet	None				0.576
Percale, yellow	None	5.769(N 0.1%)	2.236(P 5%)	0.668	0.351
	Starch		8.151(S 0.1%)	6.391(R 0.1%)	5.666(C 0.1%)
	Plastic			1.533	2.695(P 1%)
	Resin				1.043

* To be significant at the 5 per cent level t must be at least 1.979.
To be significant at the 1 per cent level t must be at least 2.616.
To be significant at the 0.1 per cent level t must be at least 3.373.
† The fabric with the wider space and the significance of the difference are given in parentheses.

TABLE 6

Effect of concentration of finish on air permeability of fabrics

FABRIC	CUBIC FEET OF AIR PER SQUARE FOOT PER MINUTE WITH FINISH INDICATED					
	As Purchased	None	Starch	Plastic	Resin	CMC
			CONCENTRATION I			
Suiting, green	187.5	182.5	206.0	181.3	188.1	209.6
Batiste, green	201.1	178.0	202.4	200.8	179.5	246.7
Percale, green	113.1	102.2	116.6	103.6	95.5	134.5
Broadcloth, white	51.5	52.3	64.7	68.5	46.0	95.9
Average	138.3	128.8	147.4	138.6	127.3	171.7
			CONCENTRATION II			
Suiting, green	187.5	182.5	165.1	199.6	180.7	250.9
Batiste, green	201.1	178.0	104.9	214.3	178.1	239.7
Percale, green	113.1	102.2	69.6	125.1	90.9	156.4
Broadcloth, white	51.5	52.3	62.4	74.2	51.5	106.2
Average	138.3	128.8	100.5	153.3	125.3	188.3

The white suiting had a permeability of 109 without finish and of 151 with CMC. In both warp and filling directions, the spaces between yarns, as shown by *t* values, were greater for the fabric with the CMC finish.

In all cases where the differences were significant, CMC increased the air permeability above no finish or another finish. The data in tables 3 and 4 show that in 23 of 27 comparisons where the differences were significant the width of the spaces between the yarns of fabrics treated with CMC was significantly greater than when they were treated with the other finishes. These data indicate that the changes in air permeability resulting from the application of finishes may be caused by changes in the width of spaces between yarns.

Effect of Concentration of Finish

Two concentrations of each finish were used for four other fabrics, the lower concentration, I, previously described (*1*) and a higher concentration, II, to learn whether air permeability differed be-

TABLE 7

*Significance of the difference in air permeability of fabrics with two concentrations of finish**

FABRIC	FINISH	*t* VALUES FOR DIFFERENCES WITH FINISH AND CONCENTRATION INDICATED†			
		Starch II	Plastic II	Resin II	CMC II
Batiste, green	Starch I	9.477(I 0.1%)			
	Plastic I		2.540(II 5%)		
	Resin I			0.206	
	CMC I				1.137
Percale, green	Starch I	7.106(I 0.1%)			
	Plastic I		7.304(II 0.1%)		
	Resin I			1.028	
	CMC I				5.409(II 0.1%)
Suiting, green	Starch I	5.020(I 0.1%)			
	Plastic I		3.944(II 1%)		
	Resin I			1.344	
	CMC I				6.807(II 0.1%)
Broadcloth, white	Starch I	0.634			
	Plastic I		2.030(II 10%)		
	Resin I			2.211(II 5%)	
	CMC I				3.158(II 1%)

* To be significant at the 10 per cent level *t* must be at least 1.753.
To be significant at the 5 per cent level *t* must be at least 2.131.
To be significant at the 2 per cent level *t* must be at least 2.602.
To be significant at the 1 per cent level *t* must be at least 2.947.
To be significant at the 0.1 per cent level *t* must be at least 4.073.
† The significance of the difference between concentrations and the more permeable finish are in parentheses.

tween concentrations. The concentrations used for I and II, respectively, were: 2 tablespoons starch to 1 quart of water and 3 tablespoons to 1 quart of water; 3.5 cups plastic starch to 4.25 quarts of water and 5 cups to 5 quarts water; 5 cups of resin finish to 5 quarts of water and 6.5 cups to 5 quarts water; and 57 grams CMC to 6 quarts of water and 85.5 grams to 6 quarts of water. The air permeability of the four fabrics with concentration is given in table 6.

This table also shows the permeability of the fabrics as they were purchased. In all but one fabric, broadcloth, the permeability was slightly decreased when the fabric was laundered to remove soluble finishes. Presumably this difference was caused by shrinkage.

As shown in table 7, an increase in concentration, II, of the plastic finish increased the permeability of the four fabrics over the lower concentration, I. In three of the four fabrics an increase in concentration of CMC significantly increased the air permeability. In only one other case, resin finish on white broadcloth, did the higher concentration increase permeability. In three fabrics the permeability did not differ significantly between concentrations of resin. An increase in starch resulted in a decrease in permeability in three of the four fabrics and made no significant difference in the fourth.

The increase in air permeability with an increase in concentration of CMC confirms the conclusion that this finish increases permeability. This evidence is strengthened by the increase in permeability with increase of concentration of the plastic finish which contains some CMC. Thus, CMC in addition to its properties of soil resistance and ease of soil removal may add that of increase in air permeability (*1*).

Summary

Four finishes—starch, resin, plastic, and CMC—were applied to each of 13 fabrics to determine the effect of each finish on air permeability of the fabric. In 89 of 130 comparisons, finishes significantly affected permeability. Fabrics differed in their response to finishes. In six of the 13 fabrics, starch increased and in two decreased permeability. In half of the fabrics, plastic starch containing CMC increased permeability, and in half it had no effect. Resin finish decreased permeability of four and had no effect on seven fabrics. In 12 of the 13 fabrics, CMC significantly increased permeability.

In most cases differences in air permeability of fabric with different finishes can be accounted for by differences in the width of spaces between yarns.

An increase in concentration of the finishes resulted, in general, in a decrease of permeability with the exception of CMC and plastic finish containing CMC where the permeability was increased. This confirms the previous conclusion that CMC increases air permeability.

Reference

1. GRIMES, M. A., and WERMAN, C. A. Effectiveness and Serviceability of Four Home-applied Cotton Fabric Finishes. Tex. Agr. Expt. Sta. Bull. 853, 1957.

Memo to:

Home Economics Administrators in Colleges and Universities

Looking ahead to the future . . . in home economics?

Through the personal invitation that you extend to your graduating seniors who have completed a major in home economics, they may join forces with 24,000 AHEA members as co-workers to build and to strengthen our profession. Each year about 450 colleges and universities grant degrees to more than 8,000 graduates who have successfully completed a major in home economics. During the year 1957-58 from 285 colleges and universities, 3,486 graduating seniors accepted the special offer you extended to become members of the Association at a special rate. Information about this rate and procedures to be followed for graduates between May 1 and August 31 have been mailed to all home economics administrators. If you have not received your copy, please write to headquarters of the American Home Economics Association.

Let's take all of our graduating seniors with us in 1958-59.

Are personality differences that can be attributed to rural or city environment disappearing? Are the home backgrounds of farm, town, and city becoming more alike in the training they afford children? These timely questions form part of the area of investigation reported in this study.

Personal Adjustment of College Students[1]

Ruby Heather Gingles

I. Personal Adjustment of Home Economics Freshmen as Related to Town or City Background

THIS study was undertaken to determine whether there are significant differences in the personal adjustment of college students who come from differing residential backgrounds. Previous studies have indicated somewhat favorable, though partially conflicting, findings for urban youth over rural youth. Such researchers as Stott (*1*), Cannon (*2*), and Landis (*3*) have found urban youth of high school age or less to be more self-reliant, more socially acceptable, and generally better adjusted socially than rural youth. Little work has been done to determine whether such findings also appear at the college level.

The subjects of the study were college freshmen in home economics at the University of Nebraska. Data on entering freshmen were collected over a period of four years [2] and included a total of 307 girls, with 145 coming from farm, 72 from town, and 90 from city homes. Cities were differentiated from towns on the basis of having populations of 10,000 or more.

The Heston Personal Adjustment Inventory was used for the determination of personal adjustment. This inventory is designed to measure personal adjustment and gives a quantitative score in six personality components: analytical thinking, sociability, emotional stability, confidence, personal relations, and home satisfaction. There is no meaningful composite score included in the test, and each of the six components was treated separately in the analysis of the data.

Analysis of variance was used to determine the significance of the differences among the three residence groups for each of the six personality components. Where significant differences were found, the t-test of separate group variances was used to determine differences between the means of individual groups (*4*).

Mrs. Gingles is an instructor in family relations in the home economics department of the University of Nebraska and is also on the staff of the Nebraska Experiment Station.

Findings

Few significant differences were found among the three residential groups. Mean scores and results of analysis of variance are presented in table 1. Since the six components of personal adjustment were analyzed separately, findings will be presented separately.[3]

Analytical thinking (A). This scale is a very independent measure as it bears practically no relation to the other five scales. It is not synonymous with intelligence but is closely related to college aptitude and achievement since it enables one to make more effective use of intelligence. A person who is high on the A scale likes to be intellectually independent and to analyze and theorize a great deal; he enjoys solving problems, is persistent and serious as opposed to casual.

[1] Published with the approval of the director as paper No. 841, Journal Series, Nebraska Agricultural Experiment Station.

[2] The author is indebted to Mrs. Fern Brown, who administered this test to students in orientation classes for home economics freshmen.

[3] Descriptions of the six scales have been taken from the manual of the Heston Personal Adjustment Inventory (*5*).

Whatever the source of this trait, residential background is evidently not a factor in its development as there were no significant differences among rural, town, and city girls in A.

Sociability (S). A person with a high S score is more interested in people than things; he makes friends easily, enjoys social mixing, converses readily, and often takes the lead in social participation. The person low on the S scale is shy and socially timid, has a limited number of friends, and usually remains in the background on social occasions.

It seems likely that because of the nature of this personality trait, some types of early environment would be more conducive to its development than others would be. In this study, however, no significant differences were found in the three groups.

Emotional stability (E). High scores in E typify persons who can remain in stable and uniform spirits, are not subject to apprehensive fears and worries, can relax easily, and see life realistically. People low in E are easily disrupted by minor crises, are frequently tired, listless, impulsive, or jittery, and suffer from tensions, worry, and uneasiness. Extremely low scores may indicate the traditional "neurotic."

No significant differences in E were found among the three groups studied. Perhaps the basis for development or lack of development of this trait goes much deeper than environmental background.

Confidence (C). Persons scoring high in C make decisions easily, adjust readily to new and difficult situations, and face the present and future optimistically. People low in C have difficulty in making decisions, distrust their ability, are often dissatisfied with their physique and appearance, and display the traditional "inferiority complex." A high positive relationship has been observed between C and E.

No significant differences on this scale were found in the three residential groups studied.

Personal relations (P). Two basic attitudes are indicated by persons having high P scores: (1) feelings that people are congenial and trustworthy and (2) ability to refrain from annoyance at the behavior of others.

As with the first four scales, it was found that the residence background was not related to high or low scores on this scale.

Home satisfaction (H). A high H score signifies pleasant family relations, a feeling of mutual understanding and respect in the home, freedom from emotion-breeding conflicts, and a healthy recognition of one's obligation to home and family. Low scores reveal conflicts with parents' ideas and feelings that families are not considerate or are too strict, domineering, unsympathetic, overly irritable, and emotional.

Although the H scale exhibits some positive correlation with all of the other scales except A, it is the only scale in which significant differences were found among the three residential groups. The F value, as shown in table 1, is 5.436, which is significant at the 1 per cent level of confidence.

When the t-test of separate group variance was applied to the three groups, the girls from city homes were significantly lower in H scores than were the girls from either town or farm homes. Differences between farm and town girls were not statistically significant ($t = 0.231$). Differences between farm and city and between town and city were significant at the 1 per cent level of confidence (t values of 2.663 and 2.696, respectively).

The H score was the only one of the personality components which yielded differences among the groups. In attempting to understand the meaning of this finding, the author considered the fact that some of the city girls who were attending the University of Nebraska were residents of Lincoln and were living at home, whereas all of the farm and town girls were away from home, many of them for the first time in their lives. Students away from home for the first time may tend to look back upon their home life with nostalgia and thus check responses from a more favorable point of view than those who are living at home and are having realistic, daily contacts with their home situation.

The investigator tested the difference between two groups of city girls, those living at home while attending college and those who were away from home, as were the farm and town girls. Of the 90 girls having city residence backgrounds, 63 were living at home and 27 were from other cities in

TABLE 1

Mean scores and F values for three residence groups and six adjustment scales

PERSONAL ADJUSTMENT COMPONENTS	MEAN SCORES OF RESIDENCE GROUPS				F VALUES
	Farm	Town	City	Total	
Number of cases	145	72	90	307	
Analytical thinking	23.34	24.07	22.24	23.19	2.128
Sociability	26.82	28.21	27.72	27.41	0.826
Emotional stability	24.34	25.56	24.74	24.74	0.662
Confidence	24.17	24.49	23.99	24.19	0.085
Personal relations	25.32	25.28	24.90	25.19	0.179
Home satisfaction	41.65	41.86	38.60	40.80	5.436*

* Significant at 1 per cent level

Nebraska. The test revealed a non-significant t value of 0.270. Among this group of girls the factor of living at home or away from home apparently did not contribute to the lower home satisfaction scores of city girls.

Discussion of Findings

Nebraska home economics freshmen from farm, town, and city homes were not significantly different on five of the six personality components included in the Heston Inventory. This finding is partially in conflict with research findings which have tended to favor urban over rural youth in some areas of adjustment. It also conflicts with opinions held by some that farm youngsters are at a disadvantage in an urban environment such as college provides and by others that the farm affords a more desirable environment than the city for the rearing of children.

A possible explanation of the findings of the present study may be found in factors not assessed here but suggested in the following questions which have not been answered. Are the home backgrounds of farm, town, and city homes becoming more alike in the experiences and training which they afford children and adolescents? Does the experience of attending high school together tend to make farm, town, and city adolescents more homogeneous than they were at an earlier period? Do farm and small town girls who go to college tend to be more like city girls who attend college than they are like other farm and small town girls?

Further understanding of the findings of this study may be gained from a consideration of the type of instrument used to measure adjustment. Although the Heston Personal Adjustment Inventory is labeled as a measure of personal adjustment, it seems more inclusive. Two components, sociability and personal relations, are made up of items encompassing the general area of social participation and getting along with people, and hence seem to be related to social adjustment. Emotional stability and confidence tend to measure an individual's feelings about himself and are more closely aligned to personal adjustment. All four of these components measure some aspect of adjustment which did not differ significantly among the three residential groups.

The author felt that two of the components, as described in the inventory and as analyzed by examination of the individual items, were not actually a measure of an individual's adjustment as this term is commonly used. Although early experiences in an individual's environment might well influence his development of analytical thinking, it seems possible that one might be low in this trait but still be considered a very well-adjusted person, or vice versa.

Consideration of the items which make up the H scale seems to indicate that it is a measure of satisfaction with one's home but not necessarily of personal adjustment.

The author would expect the 17- or 18-year-old girl to be intent upon achieving independence and hence not to be completely satisfied with the home she might soon be leaving. One might surmise that the person ranking very high on the H scale could still be relatively immature, quite dependent upon her parents, or at least "unrealistic" in checking her responses. Perhaps the girls who ranked in the middle group in H would be better adjusted than those at the extremes of the scale. If this is true, the lower scores of city girls may indicate that they tended to be slightly more mature than were the girls from the farm or small town.

Whether the higher scores on the H scale indicated better adjustment or merely satisfaction with their homes, the farm or town girls in this study rated themselves significantly higher than did city girls. There seems to be a prevailing feeling in our culture that farms and small towns provide a better environment for rearing children. This feeling may also be partially responsible for the greater feeling of satisfaction with their homes expressed by the farm and town girls included in this study.

II. Personal Adjustment of Upper Class College Students as Related to Certain Variables

Subjects in this part of the study were either juniors or seniors in college and included both men and women. The specific objectives of this phase of the study were:

1. To determine whether there were any significant differences in the personal adjustment of college students who came from either rural or urban homes
2. To determine whether there were any significant differences in the personal adjustment of students enrolled in an agricultural college and those enrolled in other colleges

3. To determine whether there were any significant differences in the personal adjustment of college students who had affiliated with social fraternities or sororities and those who had not

Rural-urban differences were again explored, with the urban group composed of students from both town and city. The investigator was also interested in determining whether any differences existed in the personal adjustment patterns of students enrolled in a college of agriculture and those enrolled in other colleges. One sometimes hears that other students tend to "look down" upon the agricultural college student, which may be a carry-over from high school, where the slower students may be encouraged to major in home economics or vocational agriculture in preference to a college preparatory course.

The third objective of the study was chosen to assess the impact of fraternity and sorority life upon college students. The nature of these social organizations suggests that they might contribute to the qualities of personal adjustment of their members since they tend to emphasize the social aspects of living.

The Heston Personal Adjustment Inventory was again used to measure personal adjustment (5). It was given to 517 college students who had enrolled in Marriage and Home Relationships classes at the University of Nebraska. There were 245 women and 272 men included in the study. These students were fairly evenly distributed as to residential background, college enrollment, fraternal affiliation, and had taken the course within a two-year period. Whether or not this sample is representative of all the students of the University of Nebraska is not known. There were students from all colleges of the university, but a disproportionately large number were from the College of Agriculture because of the fact that the Marriage and Home Relationships class is a required course for most home economics majors and is taught by the home economics faculty.

Scores for the six components of the inventory were recorded for each individual, and means were calculated for each subgroup. The t-test of separate group variances was used to determine the extent and significance of differences between these means.

Findings and Discussion

Relative to College Women

No significant differences were found between college women coming from rural or urban residential backgrounds. The mean adjustment scores of urban college women were slightly higher than those of rural women in the areas of sociability, emotional stability, confidence, and personal relations, and slightly lower in home satisfaction. The differences, however, were not great enough to be significant. Mean scores and t values for the three variables are given in table 2.

A comparison of adjustment scores of women attending the College of Agriculture and those attending other colleges at the University yielded no significant t values. The largest t value was 1.018 in home satisfaction and favored women in the College of Agriculture, but this did not represent a significant difference.

Several significant differences were found among women who had affiliated with sororities and those who had not. Sorority girls were significantly higher in sociability (at the 1 per cent level) and in emotional stability and confidence (at the 5 per cent level). Differences in the mean scores in analytical thinking and personal relations were very slight, and the mean home satisfaction scores were identical.

It is interesting to note that the findings of this study regarding rural and urban residential background agree rather closely with the findings reported in the first part of the study. With the exception of home satisfaction, significant differences were not found for either freshman or upper class women. Rural freshman students rated significantly higher than did city students in home satisfaction; upper class women were somewhat higher in home satisfaction scores, but the difference was not significant. Although the findings are

TABLE 2

Mean scores and t values for the three variables in six components of personal adjustment (women)

GROUP MEASURED	NUMBER	MEAN SCORES AND t VALUES IN PERSONAL ADJUSTMENT COMPONENTS					
		A	S	E	C	P	H*
Rural	77	23.8	27.6	26.9	26.4	26.7	40.8
Urban	168	23.8	28.6	28.6	27.8	27.5	39.7
t =		0.000	1.037	1.607	1.327	1.067	0.957
Agricultural college	133	24.0	28.0	27.9	27.2	27.4	40.5
Non-agricultural college	112	23.6	28.7	28.2	27.6	27.1	39.4
t =		0.543	0.768	0.316	0.436	0.469	1.018
Affiliated	111	23.7	29.7	29.1	28.6	27.6	40.0
Non-affiliated	134	23.9	27.1	27.1	26.4	27.0	40.0
t =		0.272	3.023†	2.160‡	2.486‡	0.948	0.000
Total	245	23.8	28.3	28.0	27.4	27.3	40.0

* A, S, E, C, P, H refer to the six components of the Heston Personal Adjustment Inventory previously described.
† Significant at the 1 per cent level of confidence
‡ Significant at the 5 per cent level of confidence

not strictly comparable, in that town and city women were both considered as urban in the second part of the study, there was some indication that any differences in personal adjustment which might have existed at the earlier years of college had leveled off by the time the girls were juniors and seniors.

Differences between mean scores of women in the College of Agriculture (who are home economics students) and other college women were even less than those between women of rural and urban backgrounds. The greatest difference in mean scores was in favor of home economics students (in home satisfaction) but was not large enough to be significant.

On the basis of the measure used in this study, home economics students compare favorably with students in other colleges. This raises the question: "Does home economics attract students who are initially as well adjusted as other students, or does it develop them so that they become as well adjusted as other students at the upper class level?" The present study has no evidence to indicate the probability of differences at the freshman level. However, the evidence that is presented gives no basis for a feeling current among some of the students and faculty that home economics students are somewhat inferior to students in other colleges. Further evidence of mental ability and other measures of interpersonal competence may help in overcoming such derogatory attitudes and give the home economics students and field the status they should have in a college environment.

Findings of the study favoring affiliated girls tended to support the expectations of the investigator. Since sororities are social organizations, one might expect the finding that sorority girls are higher in sociability. These sorority girls were higher also in emotional stability and confidence. It might be reasonable to suppose that the girl who ranks high in sociability tends to believe that belonging to a sorority is important and is likely, therefore, to be found in a sorority. Regarding emotional stability and confidence one might ask: "Does living in a sorority for two or three years tend to give a girl greater emotional stability and confidence or is the selection process of pledging developed so well that the better adjusted girls are chosen in the beginning of their college days?"

Findings and Discussion Related to College Men

Mean scores of urban men were higher than those of rural men in analytical thinking, sociability, emotional stability, and confidence. They were the same in personal relations, and urban men were but slightly higher in home satisfaction. Significant differences were found only in sociability and confidence. Urban men were more sociable and had a higher degree of confidence in themselves. Mean scores of the college men's subgroups are recorded in table 3.

No significant differences were found between men students in the College of Agriculture and those in other colleges. Mean scores tended to be slightly higher for the non-agricultural students in analytical thinking, sociability, emotional stability, and confidence but slightly lower in personal relations and home satisfaction.

The mean scores of fraternity men were higher in analytical thinking and sociability but lower in emotional stability, confidence, personal relations, and home satisfaction. Two of these differences were statistically significant: Sociability in favor of fraternity men and personal relations in favor of non-fraternity men (both significant at the 5 per cent level of confidence).

The general impression gained from the findings about men students in this study seems to indicate that the city and small town boys had some advantage over farm boys in matters of personal adjustment. These findings tend to confirm those of other researchers who have studied farm and town children and younger adolescents. Farm boys may not have as favorable opportunities for the development of traits of personal adjustment, and this handicap may still tend to persist at the upper

TABLE 3

Mean scores and t values for the three variables in six components of personal adjustment (men)

GROUP MEASURED	NUMBER	MEAN SCORES AND t VALUES IN PERSONAL ADJUSTMENT COMPONENTS					
		A	S	E	C	P	H*
Rural	131	23.2	25.1	29.1	27.6	26.4	39.8
Urban	141	24.0	27.1	30.5	29.6	26.4	40.0
t =		1.221	1.972†	1.622	2.339†	0.000	0.216
Agricultural college	127	23.3	25.3	29.3	27.9	26.5	40.8
Non-agricultural college	145	23.9	26.9	30.3	29.3	26.4	39.1
t =		0.909	1.578	1.159	1.634	0.146	1.870
Affiliated	125	24.0	27.5	29.2	28.5	25.6	39.0
Non-affiliated	147	23.3	25.0	30.4	28.7	27.1	40.7
t =		1.074	2.488†	1.364	0.231	2.134†	1.812
Total	272	23.6	26.2	29.2	28.6	26.4	39.9

* A, S, E, C, P, H refer to the six components of the Heston Personal Adjustment Inventory previously described.
† Significant at the 5 per cent level of confidence

class level in college. The non-agricultural students tended to exhibit slightly higher, but not significantly higher, scores in most areas. The rural factor may account for the lower scores of agricultural students due to the fact that there was a disproportionate number of rural boys in the College of Agriculture as compared to rural boys in other colleges.

Affiliation or non-affiliation with fraternities did not seem to be a consistent factor in adjustment. The higher scores of fraternity men in some areas were offset by higher scores of non-fraternity men in other areas. Fraternity men were higher in sociability as one might expect. The reason for higher scores by non-fraternity men in personal relations is not so readily explained. According to the descriptions given of this component it would mean that non-fraternity men would be higher in (1) feelings that people are congenial and trustworthy, and (2) ability to refrain from annoyance and irritation at the behavior of others (5). The implications of this finding would pose this question: "Do fraternities tend to draw from a group of young men who are less democratic than those who prefer to remain independent or do they tend to foster and/or develop less democratic feelings in their members than are found in the independent group?"

Summary and Conclusions

The first phase of this study was conducted for the purpose of determining the relationship between rural-urban residential background and the personal adjustment of college freshmen. Data were collected on 307 home economics freshmen during a period of four years at the University of Nebraska. The Heston Personal Adjustment Inventory was used as the measure of personal adjustment (5).

No significant differences were found among farm, town, and city girls in the following five components of personal adjustment: analytical thinking, sociability, emotional stability, confidence, and personal relations. Farm and town girls ranked significantly higher than did city girls in the sixth component (home satisfaction). No differences were found between those city girls living at home while attending the University and those who were away from home.

In the second phase of the study, the Heston Personal Adjustment Inventory was given to 517 upper class students (245 women and 272 men) who were attending the class in Marriage and Home Relationships at the University of Nebraska. The purpose of the research was to study personal adjustment in relation to rural or urban residential background, enrollment in the College of Agriculture as compared with other colleges, and affiliation or non-affiliation with sororities or fraternities. The following conclusions are based upon the findings of this phase of the study:

1. There were no significant differences in the personal adjustment of upper class college women coming from rural or urban backgrounds.

2. There were no significant differences in the personal adjustment of upper class women who were enrolled in the College of Agriculture (home economics majors) and those enrolled in other colleges.

3. Sorority women ranked significantly higher than did non-sorority women on the sociability component of personal adjustment. There were no other significant differences in personal adjustment between sorority and non-sorority women.

4. College men from urban homes ranked significantly higher than did those from rural homes on sociability and confidence components of personal adjustment. There were no significant differences in the other personal adjustment components.

5. There were no significant differences in the personal adjustment of men enrolled in the College of Agriculture and those enrolled in other colleges.

6. Fraternity men ranked significantly higher than did non-fraternity men on the sociability component of personal adjustment, whereas non-fraternity men ranked significantly higher on the personal relations component. The other four components revealed no significant differences.

The findings of both phases of the study seem to indicate that rural-urban differences between children and younger adolescents noted by other researchers have tended to disappear as far as girls are concerned but to persist to some extent for boys (as evidenced by higher sociability and confidence scores for urban men). This sex difference may indicate that rural girls become urbanized more readily than do rural boys.

No evidence was found in this study to support the feeling that students in the College of Agriculture are "different" from other students. Either the students who enroll in the College of Agriculture do not differ in qualities of personal adjustment, or such differences no longer persist at the upper class level.

Some evidence was found to support the assumption that fraternities and sororities contribute to an individual's personal development. Affiliated women ranked higher in emotional stability and confidence. Both affiliated men and women ranked higher in sociability; however, non-affiliated men ranked higher in personal relations. Whether the high sociability scores of the affiliated can be attributed to fraternity or sorority life is a matter of conjecture. They may as readily be construed to mean that individuals strong in this trait seek out fraternities and sororities as a means of satisfying a need.

There was more evidence favorable to sorority women than to fraternity men. One might ask whether sororities place more emphasis on the personal and social development of their members than do fraternities or

whether sorority women represent a different segment of the female population of a university than fraternity men do of the male population.

The investigator feels that the principal conclusion to be derived from both phases of this study is that researchers need to go beyond the variables studied here if they are to gain genuine insight into the factors that contribute to personal adjustment. Mean group scores did not differ greatly, but individual scores on such a test as the Heston Personal Adjustment Inventory did differ greatly, indicating that by the time individuals have reached college age they vary considerably in their ability to make the necessary adjustments to their environment. From whence come these differences? Researchers need to develop techniques for studying family life and interpersonal relations more intimately if they are to answer this question.

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Tentative Program—49th Annual Meeting

American Home Economics Association

Philadelphia, Pennsylvania, June 24-27, 1958

Monday June 23	**Executive board meeting** **State presidents' and councilors' unit of the AHEA council** **Joint luncheon and meeting of executive board and presidents' and councilors' unit** **College clubs mixer** **Registration begins**
Tuesday June 24	**9:00 to 10:00 a.m.—Special meetings of committees and sections' officers and committees** **10:30 a.m.—General session** **Afternoon—Visit exhibits** **7:30 p.m.—Reception at the Art Museum**
Wednesday June 25	**9:00 to 9:45 a.m.—Eye opener** **10:30 a.m. to 12 noon—Subject-matter sections' business meetings** **12:15 p.m.—Alumnae luncheons** **2:00 to 4:00 p.m.—Subject-matter sections and college clubs** **8:00 p.m.—General session**
Thursday June 26	**7:00 to 8:30 a.m.—Phi Upsilon Omicron breakfast** **9:00 to 9:45 a.m.—Eye opener** **10:30 to 12 noon—Professional sections' business meetings** **12:15 p.m.—Alumnae luncheons** **2:00 to 4:00 p.m.—Professional sections and college clubs** **4:00 p.m.—Omicron Nu tea** **8:00 p.m.—AHEA business and council meeting**
Friday June 27	**9:00 to 9:30 a.m.—Eye opener** **9:30 to 10:00 a.m.—AHEA council meeting** **10:15 a.m. to 12:15 p.m.—General session** **1:30 p.m.—Professional trips** **2:30 to 5:00 p.m.—State presidents' and councilors' unit of the AHEA council**
Saturday June 28	**Executive board**

The broad outlines of research methods in child development are not always easy to distinguish from the individual reports of research studies, nor is it always easy for those who are not themselves research workers in the area to relate each research study to the larger group of studies to which it belongs. The authors present both of these perspectives in the following article.

Development and Use of Research Methods in Child Development[1]

D. Bruce Gardner, Glenn R. Hawkes, and Damaris Pease

Dr. Gardner is an associate professor, Dr. Hawkes a professor and head of the department, and Dr. Pease an associate professor in the department of child development in the Division of Home Economics at Iowa State College. This article has been recast for the *Journal* from a paper on the same theme presented at the 1957 annual meeting of AHEA by Dr. Gardner and Dr. Hawkes.

THE changes occurring in the human organism from the moment of conception until maturity have presented the scientist with a challenging and fascinating area of research. The data of even such gross and superficial characteristics as height and weight are sufficient to give pause: During the 280-day period of prenatal life alone, the human organism increases in length by roughly five thousand times. His weight, during the same period, is multiplied by about six million. During the third month of fetal life he is growing so rapidly that if he were to continue at the same rate until the age of ten, he would then be about 20 feet tall (*1*, p. 30). Intelligence, language development, the growth of moral concepts and values, emotional and social growth—all of which are of interest to scientist and layman alike—are even more subtle and complex than mere increases in height and weight.

There is now available a voluminous literature on child growth, stemming from research findings. Much of the research has represented attempts to outline the stages of growth from conception to maturity and the expectations which parents can justifiably hold for their children at each stage. The contribution of Arnold Gesell and his colleagues exemplifies this kind of research finding.

However, the basic question to which the student of child development is turning today is not that of describing the details of changes which occur in normal development. Instead, it is the whole question of the *why* of human growth. *Why* does the human organism go through the regular patterning of development from conception to maturity? *Why* do some infants fail somewhere along the line, either before or after birth, to achieve the fullness of their growth potential? These are basic questions confronting the research worker in child development today.

Review of Problems and Methods

The field of child development has grown up from many roots and has points of intimate contact with such diverse disciplines as biology, morphology, education, home economics, psychology, human nutrition, psychiatry, and sociology. A primary contribution of child development is the organization of the findings of these disciplines into a meaningful, integrated body of knowledge about the growth and guidance of children. In addition, the child development specialist attempts to go beyond the organizing function into the realm of fundamental research. The formulation of basic hypotheses about growth, and the testing of these hypotheses with the tools and techniques available, are part of his work.

The development of research with children has been closely interwoven with the improvement of tests and measurements of a wide variety of kinds. The intelligence test had its earliest and most extensive applications with children. The history of

[1] Journal Paper No. J3332 of the Iowa Agricultural and Home Economics Experiment Station, Ames, Iowa. Project No. 1299.

intelligence testing provides us with something of a preview of things to come in the measurement of personality. The demand for a useful intelligence test grew out of a desperate need to cope with one kind of abnormal child, the mentally retarded. The development of adequate techniques for the measurement of intelligence led to the much broader application of testing to normal children and adults. Similarly, our understanding of human personality has come largely from our desperate need to cope with abnormal personalities. With the development of tools for diagnosis and treatment of various classes of psychological disturbances, we are now beginning to formulate some workable statements about the normal, healthy personality.

Scattered and sporadic attempts were made during the early part of this century to investigate complex functions such as emotional development and social growth. These, however, were limited to attempts to describe and catalog the child's repertoire of emotional and social behavior at different age levels. Thus a set of norms was constructed, in relation to which the progress of a child or group of children might be assessed. Later, with improved statistical procedures, it became fashionable to try to establish relationships between aspects of growth. Such questions as the extent to which physical and mental growth might be associated were investigated, and the degree of correlation between nutritional status and intelligence was estimated.

In fairly recent years efforts have been made to assess the development of the "child as a whole." Olson (*2*) described the child in terms of "organismic age," a concept which combined the known elements of relevant data on a child into an overall index of his total growth. Such concepts have proven to be useful in certain ways for predicting future growth and for understanding the nature of the growth process. But as has long been recognized by research people, the whole child does not grow up in a vacuum or in a psychologically sterile laboratory or clinic. He grows and learns and behaves in relation to his psychological field and the significant objects within that field.

Some efforts have been made to study the complex interaction processes between the growing child, as he moves forward in time, and his psychological world of people and things. One outstanding contribution along this line in recent years is the work of Barker and Wright (*3*), who made an intensive study of the children in a small midwestern community. Their central investigative technique was the specimen record, described as a "detailed, sequential narrative of a long segment of a child's behavior and situation as seen by skilled observers" (*3*, p. 15). Perhaps as significant as any single finding of this study was the affirmation of the usefulness of the field study method in research on children.

This method of obtaining data has the disadvantages of crudeness and subjectivity, which account for its repudiation following the early beginnings of research on children. To some extent these weaknesses can be corrected by modern recording techniques and equipment. Furthermore, it has the singular advantage of taking into account the natural setting within which, and the objects around which, behavior occurs. As Barker and Wright have pointed out (*3*, p. 14):

> Despite the practical and theoretical importance of behavior as it is directly seen, one can not go to the scientific literature of child behavior to find what the behavior of children looks like. One must go to the novelists, the diarists, the news reporters. This is true because most data of psychology have been assembled in terms of particular problems or theories and this almost always requires the fractionation of behavior to such a degree that its appearance is destroyed. The psychological landscape is strewn with the debris of these dismantling operations.

Contributions of Home Economists

There are some research workers who tend to equate research with experiment and who accept nothing less than rigorous control of all known variables in order to determine the precise effects of variable A on variable B. Others feel just as strongly that many useful and important kinds of information about children have come not through rigorous experiment but through clinical, case history, field study, and other non-experimental procedures.

To get a clearer picture of the contributions of child development research people who operate within the professional area of home economics, we might turn briefly to a report made recently by a committee of the division on developmental psychology of the American Psychological Association (*4*). The committee surveyed 357 institutions of higher education in the United States, addressing a questionnaire to those departments and divisions which might presumably offer graduate programs in child or adolescent development. One central question was on the number and kind of research projects on children which had been carried out during the two-year period ending in June 1954.

The research projects reported by these departments and divisions were classified in one of three

categories: (1) descriptive, developmental, comparative; (2) tests and scales: development and validation; and (3) experimental, manipulative. Figures were reported for each of the disciplines for each of the three classes of research. For purposes of this paper we have compared the first and third classes of research, and we have combined the figures for the academic areas other than home economics, against which the home economics research might be compared. Those other disciplines included departments of education, psychology, and social work. A portion of the data is shown in the following table.

Types of research in child and adolescent development, 1952–54

(Data are taken from the report of the fact-finding committee on the present status of training and research in child and adolescent development.)*

FIELD	DESCRIPTIVE: DEVELOPMENTAL AND COMPARATIVE	EXPERIMENTAL	TOTAL
Home economics	70	5	75
Other	143	55	198
Total	213	60	273

* Used by permission.

During the period covered by this research, disciplines other than home economics reported 198 research projects in child or adolescent development. Fifty-five of these, or nearly 28 per cent, were classified as experimental studies. During the same period, home economics people reported 75 research projects on children, of which only five (roughly 7 per cent) were experimental studies. The remainder (exclusive of a few reported in category 2 and not shown in the table) were classified as descriptive studies.

A simple chi-square test was made by the writers to determine the level of statistical significance of the differences observed between home economics and non-home-economics research on children. The chi-square value was found to be 12.95, indicating that there is less than one chance in a thousand that this is merely a sampling error or chance finding. Presumably, then, there are factors within home economics which tend toward the production of nonexperimental research on children.

To the extent that the experimental method is crucial to our field, we may be inclined to say that home economics people need to turn more toward the production of that kind of research with children. On the other hand, to the extent that the descriptive and comparative studies may be said to make a unique and essential contribution to the research literature, it would seem that home economics people have been giving their fair share in that contribution.

Research on Personality Development

Another aspect of the report of the committee on that same survey has, we believe, special significance for home economics research people. The committee outlined 11 major problem areas within which research was being done by the responding institutions, as follows: (1) physical and motor development, (2) intellectual development, (3) language development, (4) personality development, (5) mental health, (6) education, (7) social and cultural forces, (8) group status and behavior, (9) heredity-environment, (10) physical health and nutrition, and (11) professional problems.

Of the total of 292 research projects reported by the different institutions, 124, or 42 per cent, were in the category "personality development." The remaining 58 per cent of the projects were distributed over the other ten problem areas. So far as home economics is concerned this intense interest in the processes of personality development showed up even more strikingly. Of 77 projects reported by home economics people, 42, or 55 per cent, were classified in the category "personality development." The conclusion seems obvious that child development people, particularly those working within the field of home economics, are concentrating a good share of their research efforts in this problem area.

This concern for the study of personality growth parallels, of course, the development of tools and techniques for measuring personality. Although this has lagged behind measurement in other areas, such as physical growth, intelligence, or nutrition, there can be no question but that we have more highly developed tools now, both for the collection and for the analysis of data on personality, than we have ever had before. At the same time, it is equally apparent that we still have a long way to go in developing tools for research on personality growth. If personality can be defined roughly as the ". . . persistent tendencies to make certain qualities and kinds of adjustments," (5, p. 310), it is fair to say we are really just beginning to understand the nature of the growth of personality.

Research people have tried to measure these tendencies to adjust in certain characteristic ways through a wide variety of methods. Rating devices, with which the observer either (1) ranks each child in relation to every other child in a group

with respect to some trait, or (2) rates each child against a scale representing a continuum from high to low in some trait, have been widely used. Aside from the question of reliability, an important criticism of these rating devices is that they are frequently based on questionable assumptions about the existence of personality traits.

The questionnaire method, which has often been used to gather information from adults about children, also suffers from important limitations. It is subjective; it is limited by the selective memory of the adult who is questioned; it is subject to error based on misinterpretation of the questions; and it is probably affected by the needs of the questioner.

Because of the irregularities in the rate of progress of different aspects of the science of child development, it is understandable that we tend to use the more primitive methods of classification and description in some areas of research, while in others we can move on to the use of experimental procedures designed to test well-defined hypotheses. The use of projective techniques offers an interesting illustration of this kind of progress, inasmuch as we are currently witnessing a changed emphasis from a purely descriptive use of these tools to one of relatively controlled experiment.

Although there are many kinds of projective devices, underlying all of them is the assumption that people reveal significant aspects of personality by the ways in which they perceive and respond to their environment. The most widely used and highly publicized of these techniques is Rorschach's Test, which consists of a series of ten ink-blot figures printed on cards. The responses of normal adults and various classes of abnormal persons have been described and classified through years of study. More recently, the characteristic responses of children at different age levels have been described, first by Ford (*6*) and later by Ames *et al.* (*7*).

Other methods, based on essentially the same principle of projection, have been devised in recent years for the study of various aspects of personality in children. Animal pictures, as used in the Blacky Test and in the Children's Apperception Test, seem fairly effective in getting children to respond. These, like the Rorschach, are limited in that they depend on the child's ability to verbalize his responses.

Certain variations on projective methods have attempted to get away from this limitation. Doll-play procedures are one example. Briefly, this might involve placing a child in a room free from distracting influences, where a number of dolls are available to him, and observing his responses to the dolls. Some of the dolls might represent parent figures; others might be perceived as infants or older siblings, in relation to whom he might express a variety of emotions. Such methods have the advantage, in addition to being free from the limitations of the child's verbal ability, of giving the child a safe medium through which he can express strong feelings. Research using such procedures is helpful in revealing the content and structure of personality at different age levels and can give us important clues to the needs, inhibitions, and conflicts of normal as well as exceptional children.

All such methods are limited by the relatively subjective interpretation of the observer and by his theoretical orientation. To help overcome these limitations, several observers may be used simultaneously. But one of the big problems in conducting research on personality development remains that of reliability. If two observers are unable to agree on what a child did in a free play situation, let alone on why he did it, or what the significance of his act was, then the method is more frustrating than useful. Usually this means that observers must undergo special training sessions in order to prepare them to see the same things in a given situation.

But even if we could assume that the available measuring instruments, such as rating scales, psychometric tests, projective devices, etc., were highly reliable and valid, the problems of research in personality development would not be solved. As research in any science reaches out beyond mere classification and description of observed phenomena, its progress is directly related to the ability of the research worker to ask meaningful questions, that is, formulate testable hypotheses and devise logical and orderly procedures for obtaining the answers to these questions. This is the province and the mission of experimental research. It is only through careful and conscientious development of a research model, tailored to fit a unique, well-stated hypothesis, that significant progress can be made with the experimental method.

We have already reached a saturation point in the correlating of some isolated and highly abstract variable X (such as socioeconomic status) with some other isolated and equally abstract variable Y (such as school achievement). Studies of this kind have been interesting and have helped us to formulate better hypotheses, but unfortunately

they tell us nothing about the reasons *why* variables X and Y might be correlated, or about the many intervening variables between X and Y which may be more basic, and of which the X-Y relationship may be no more than symptomatic. The need now is for well-designed research at the experimental level, but it must be based on accurate and meaningful organization of data at the descriptive and classification level.

In an effort to apply the experimental method to certain basic questions about personality development, the writers designed a study, currently in progress, on the effects of non-continuous mothering on the growth of infants.[2] The experimental group consists of 36 infants, each of whom lived in a college home management house for a period of about three months. Two other groups of infants, representing two classes of experimental control, are also being studied. One of these control groups consists of infants who lived in foster homes for a period of time following birth, and the other is made up of infants who experienced only continuous mothering in their own natural homes from the time of birth. Medical and psychological data, using standardized psychometric tests, as well as detailed information on physical growth, are being collected on the subjects through the first two years of life.

The research design is not new or unique, but it was tailored to meet the needs of the particular problem. Presumably, if there are no measurable differences among the three groups of infants at the outset, but important differences appear as the groups are followed, then the differences might be attributed to the different kinds of mothering experiences. Of particular interest is the inclusion of two control groups. This provision makes it possible to test the specific hypothesis that continuity of mothering during infancy is a crucial variable in the personality development of children. If differences between home management house infants and natural home infants are discovered, and are attributable to hereditary differences between the two groups, then presumably the same differences should be found to exist between the foster home babies and the natural home babies.

Mention is made of this particular research project to illustrate one application of the experimental design to a problem which in the past has been treated largely in terms of nonexperimental methods. There are some weaknesses and limitations which become apparent when one works closely with the details of such a project, but these are not different from the limitations inherent in most research on the growth of human personality. If there are risks in terms of the relatively low reliability of the measuring instruments available for infant study, it is regrettable; the alternative to the taking of these risks, that is, using only those instruments in which we have complete confidence, would be even more regrettable. In so doing, we would limit ourselves to the recording of gross and superficial characteristics which would be, perhaps, the least important aspects of personality affected by such a variable as continuity of mothering in infancy.

Many fragmentary studies have been made which establish a moderately or highly significant correlation between two or more kinds of conditions in the lives of children. These are essentially relationship studies which enable us to say that when the first condition is present there is a certain level of statistical probability, depending on the degree of correlation, that the other conditions will be present also. We have become acutely aware of the dangers of sweeping statements about *why* these other conditions will occur and find that we must avoid making such statements until we know a good deal about the intervening variables in the specific relationship with which we are concerned.

A simple example of this might be such a statement as "The child who is loved feels secure." We like to make such statements, even in the field of child development. And while few persons would question the validity of the basic relationship implied in this statement, we have to remember that it tells us nothing about *why* he feels secure. We would be on dangerous ground, furthermore, if we tried to claim that two children who are equally loved are equally secure. Obviously, there is less than a perfect relationship between the condition "love" and the condition "security." Our need then is to know more about the nature of intervening variables which operate between these two relatively abstract conditions and which alter the effect of one on the other, from one child to another. Nonexperimental research, including individual case studies and detailed observation of children in their own natural setting, can make an invaluable contribution in exploring for some of these variables; but it is within the province of the experimental design to make rigorous tests of hypotheses about the precise effects of each variable, under well-defined conditions.

[2] For a more complete description of the methodology as well as the theoretical basis of this research project, see Pease and Gardner (8).

Need for a Co-operative Approach

One of the research needs of which we have long been aware, but which becomes increasingly apparent in an area such as child development, is for high-quality research using the insights and special training of a number of disciplines at the same time. Multi-disciplinary research is not new, of course, but even for those who are intellectually convinced of the desirability of such an approach, it is always easier to slip back into the comfort and familiarity of one's own discipline and close the shutters against the threat of misunderstandings, rivalries, and just plain hard work.

People in home economics are people, just like anyone else, and find it easier to work in their own domain. But they have also risen to the challenge of inter-disciplinary research at times, and the results have been interesting and gratifying. The general objective of one such study, currently under way, is to determine the effects on families of having carpeted or hard-surfaced floors in the living areas of the home.[3] College staff personnel in household equipment, home management, statistics, and child development are co-operating in the project. In addition to economic problems such as cost of upkeep, time and energy required for care, and similar factors, attempts are being made to get at more subtle aspects of effects on families, such as differences in child-rearing practices, family activities, children's play and play equipment, and personal comfort and satisfaction. Thus, even a relatively small aspect of the home, namely, the type of floor covering, warrants the combined attention of people from a variety of disciplines, if we are to assess its role in child development and family living.

Some Research Needs

In this paper we have not attempted to place one kind of research in a superior position in relation to any other kinds. Our use of the term "nonexperimental" should not be confused with "nonscientific," for there are many kinds of nonexperimental studies which adhere to the best precepts of the scientific method.

We have many unmet needs for research in child development. Among the outstanding ones are (1) the need to observe the child in his own natural setting, (2) the need to combine the resources of various disciplines in intensive, well-controlled investigations of certain core variables which lie between the abstract conditions of child rearing on the one hand and personality on the other, (3) the need to relate the experimental findings of the testing room and laboratory more constructively to the findings of the clinician and of the field worker who see the child in his natural habitat, (4) the need for continued emphasis on methods which enable us to see the growth trends of a child as well as his status at any given moment in time, (5) the need to know more about the relationship between childhood personality characteristics and the adult personality, and the extent to which a given characteristic is comparable at all age levels, and (6) the need for much more basic research on the precise manner in which a child comes to perceive himself and his psychological world in the unique way he does.

Satisfaction of this last need involves a thorough investigation of the problems of interpersonal communication within the family, to determine how and why a child learns to perceive the communicative acts of his parents and siblings in the way he does.

These and other problems are very much with us, waiting to be resolved. It is through a healthy interaction of a wide variety of research personnel, using the many methods, tools, and techniques now available, and focusing our combined attention on the basic question of *why* a child grows as he does, that progress will continue to be made in the field of child development research.

[3] Elizabeth Beveridge, *et al.* Relative Maintenance Costs and Satisfactions to Users of Carpeted and Smooth-surfaced Floors. Iowa Agr. & Home Econ. Expt. Sta., Research Project 1339. In progress.

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Any teacher who has ever stated "Debbie is Mary Lou's best friend" will be interested in this study of such judgments as will college and university teachers who are interested in determining ways to develop or to predict the accuracy of such judgments.

Personality Characteristics of College Students and Accuracy of Their Judgments of Children's Social Acceptance[1]

Helen R. Marshall

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TEACHER judgments of children's social acceptance are used extensively as indicators or estimates of children's personality or adjustment, both in conferences with parents and in training of students in child development courses. Such use of this measure of children's social acceptance is made questionable by the findings of investigations of relations between adult judgments of children's social acceptance and other measures of children's social acceptance (*1, 2, 3, 4, 5, 6, 7*). All studies report that individual teachers or club leaders vary greatly in their ability to predict children's choices of playmates on sociometric tests and as observed in play and that judgments of many teachers and leaders are very inaccurate.

A "best guess" as to the accuracy of these judgments for an individual teacher cannot be made at present. Characteristics related to this adult variability have been sought but not found in investigations to date. The list of factors reported not to affect the accuracy of adult judgments (*3, 4, 5, 8*) includes age, years of teaching or experience with youth groups, length of acquaintance with the group or with individual children, years of residence in the community, recency of college training, semester hours of psychology and education courses, marital status, and status as a parent in regard to number, sex, and age of children. A similar judgment ability, accuracy of judgment of social acceptance in an adult peer group (*4*), is the only adult characteristic reported to relate to accuracy of adult judgments of children's social acceptance. Child and group characteristics have been related to accuracy of these judgments (*3, 4, 5, 8*) but are insufficient explanation of the fact that one-third to one-half of the teachers or leaders studied would have done as well if they had never seen the children (their accuracy was at a chance level), while others could judge at a 90 per cent (or r of 0.90) level of accuracy.

This study investigated relations between personality characteristics of the adult and accuracy in judging children's choices of friends. The six personality characteristics and measures selected for investigation were:

1. Social acceptance by peers (in a college course recitation section), as determined by a sociometric test
2. Socioempathy (predicting the social behavior of others), defined here as the individual's ability to name three peers who will select the individual on the sociometric test
3. Manifest anxiety, or the degree to which the individual expresses anxiety or fearfulness on the Taylor Manifest Anxiety Scale (*9*)
4. Attitudes toward family life expressed on the Parental Attitude Research Instrument (PARI) (*10*)
5. College entrance examination score, used as an indication of intelligence
6. Semester grade in a child development course, indicating mastery of related material

The study was based on the assumption (to be tested) that many college student observers can make accurate judgments of the social acceptance of the children observed. To be equivalent in

[1] The investigation reported in this paper is in connection with a project of the Kentucky Agricultural Experiment Station and is published by permission of the director.

judging the social acceptance of children to the teachers and leaders studied to date, at least one-half of the students would need to make judgments that agreed with children's choices to an extent beyond that possible by chance. It was hypothesized that at least one-half of the college students would have this ability, since no relations have been found between age, education, or experience of teachers and leaders and the accuracy of their judgments of social acceptance of children in their groups. For the purpose of this study, it was an advantage to use college student subjects who had regularly observed the same group of children as their laboratory experience in a child development course. Variation due to differences in child groups was thus eliminated as a factor affecting judgment of the adult.

Subjects and Procedures

Subjects (Ss) were 131 students in a freshman-sophomore-level class in child development at the University of Kentucky. There were 104 women, predominantly majors in home economics and nursing curricula, and 27 men, the majority of whom were on the varsity football squad. In the fall semester, 70 Ss were enrolled in two class sections, and there were 61 Ss in two class sections during the spring semester. The same instructor taught all four sections.[2] Six other students were absent on test days.

At the time of testing, all Ss had observed the preschool group of children for 10 or 11 weeks of two-hour laboratory observation periods. Their 20 to 22 hours of observation was markedly less than the acquaintance time possible for the adult judges used in other studies. Social acceptance had not been studied as a class or laboratory topic.

Tests were administered to Ss during regular class periods by the author. All tests except the PARI were completed in one class period; the PARI was completed in part or as a whole at the class period two days later.

The scores or categories for the tests defining the six characteristics of college students are described below, in the order of test administration for the first four.

1. *Class sociometric score.* Each S was asked to choose three members of the class section as preferred companions for each of three situations. First choice for any situation was weighted three points, second choice two points, and third choice one point. The class sociometric score of each S was the sum of the weighted choices of S by other students plus one (*11*).

2. *Socioempathy classification.* Each S was asked to list three members of the section that she (he) thought would probably choose her (him) on the sociometric test. The list was compared with the sociometric choices of S's nominees. The socioempathy score was the number (3, 2, 1, or 0) of choices of S by others that S predicted correctly.

3. *Manifest anxiety score.* A short form of the Taylor Manifest Anxiety Scale (*9*) was used. In this Iowa modification (*12*), the 50 statements were unevenly separated by statements of the K scale of the Minnesota Multiphasic Personality Inventory and the Lie Scale. Scores of the 14 Ss with Lie scores of 7 or more were discarded in the study of relations. Manifest anxiety scores (A scores) of the 117 Ss ranged from 2 to 33 and had a mean of 15.93. Scores at each percentile point were one point higher, but otherwise the distribution for these Ss resembled the distribution of scores of about two thousand Iowa college students (*9*).

4. *PARI scores* of attitudes toward family life. The test of attitudes used was the Iowa modification (*12*) with forms for both sexes of the Parental Attitude Research Instrument developed by Schaefer and Bell (*10*). Point scores were computed for the five-factor analysis composites of Schaefer and Bell and for the five specific attitude scales not included in these composites, all listed in the table. Three Ss were absent and did not complete the PARI.

5. *College entrance examination scores.* The general ability score (GA score) and the examination total score (T score) of the Kentucky Classification Battery were obtained for 128 Ss. Scores were not available for two students entering the University as graduate students, and the maiden and test name of one married woman S could not be identified. All scores were expressed as percentile rank among the several thousand students entering the University each year. The distribution of scores among the 128 Ss was not the rectangular percentile rank distribution, although scores ranged from 1 to 99 and there were at least 5 Ss in each decile. The 20th, 50th, and 80th percentiles for T scores of these Ss were 21, 39, and 63, respectively, and the mean score was 43.

6. *Semester grade,* or mastery of related material. Semester grades for a course in child development were used as a four-category classification. Grades of A, B, and C (average) constituted three

[2] The author wishes to express appreciation for the cooperation of the recitation section's instructor, Mrs. Jessie W. Ringo, and for the assistance of Lucille Magruder and Mrs. Betty Clay Witt in scoring of tests and in computations.

categories; D, E, and F were combined in an "unsatisfactory" category.

Accuracy of student judgments of children's best friends was determined by their correspondence with children's observed best friends and sociometric choices. Students were requested to list the three children they thought each child would select as his or her best friends on the child's sociometric test. These judgments were requested immediately after the class sociometric and socio-empathy choices were elicited and before the Manifest Anxiety Scale was given. Students had observed 12 children (six of each sex) in the fall nursery school group and 13 children (seven boys and six girls) in the spring group. One boy in the fall enrollment of 13 children was so often absent that many students had never seen him. Ten children were the same in both groups.

Children were given the picture sociometric test (7) by the author within one week of the students' judgments. They were asked to choose three playmates for each of three situations. Since choice number was not limited to three, first choice was weighted five points, second choice four, third three, fourth two, and other choices one point. The child's sociometric three best friends were those three choices of the child having the highest summed point scores for the three situations.

A minimum of 100 minutes of observation of social interactions in free play situations was recorded by the author for each child within the three weeks preceding student tests. The recording method and scores were those developed by McCandless and Marshall for observation of play interactions in nursery school groups (6). Each child's observed three best friends were defined to be the three with whom the child had the largest number of "friendly" interactions in recorded observations.

Both observed and sociometric choices of children's best friends were used in this investigation because teacher prediction differed for the two choices in one investigation (6, 7). The number of agreements between the choices made by the child Ss in this investigation was 23 of a possible 36, or 64 per cent, in the fall nursery school group, and 24 of a possible 39, or 62 per cent, for the spring group.

Scores for accuracy of student judgments were the per cents of possible agreements with children's choices of three best friends. *Per cent O score* is the per cent agreement of the student's choices with the children's choices of best friends as observed in play. *Per cent S score* is the per cent agreement of the student's choices with children's sociometric choices.

Whether number of agreements was within or beyond chance probability was determined for each student's choices of children's best friends with the two types of children's choices. The chi square test used to test the null hypothesis in this situation has been described elsewhere (7). Depending on the number of times the student succeeded in naming three choices of the child correctly, in most instances agreement of student's and children's choices was significant beyond the 0.05 level when there was 47 to 50 per cent or more agreement in the fall nursery school group, and when there was 44 to 47 per cent or more agreement in the spring nursery school group.

Product moment and partial correlations were used to determine relations between accuracy scores and scores defining personality characteristics. Only data for total sample distributions were used in computing these r's because these data appeared to meet the assumptions required for these indices. When these distributions were split into semester, sex, or class section divisions, the data did not meet required assumptions. For example, when an attempt was made to determine differences associated with A scores in the smaller divisions, A score variance was heterogeneous (spread of scores was not the same) in all three splits by Bartlett's test.

Results and Discussion

Accuracy of student judgments. For 105 Ss (80 per cent), agreement between the student's choices and children's observed choices of three best friends was significant beyond the 0.05 level. This agreement was significant beyond the 0.001 level for 68 students (52 per cent). Agreement between student's choices and children's sociometric choices of three best friends was significant beyond the 0.05 level for 74 Ss (56.5 per cent); only 5 per cent (7 Ss) of these agreements were significant at the 0.001 level. In other words, accuracy was within a chance level in such choices for only 20 per cent of the Ss in the observed best-friends comparison, and for 43.5 per cent of the Ss in the sociometric best-friends comparison. The relative number of chance and beyond-chance judgments is about the same for these college student Ss as has been reported for teachers and club leaders. This finding is in agreement with the hypothesis on which this study was based: that college student observers are equivalent to adult teachers and club leaders in judging the social acceptance of children.

The mean per cent O score for 131 Ss was 56.34, with a standard deviation (SD) of 12.12 and a range from 25 to 78. The mean per cent S score was 47.17, with an SD of 9.56, and a range from 22 to 67.

The r between per cent O and per cent S scores was 0.965, a very striking indication that accuracy of adult prediction of children's sociometric choices depends directly on accurate observation of social acceptance in the group of children, regardless of whether it depends also on ability to use this information in forming judgments.

Correlations with personality scores. Correlations of accuracy scores with scores defining personality characteristics are listed in the table, as are the correlations of manifest anxiety scores with scores for other personality characteristics. These were used for partial r's to control influence of either score.

The largest r's with accuracy scores are the −0.47 and −0.48 obtained for manifest anxiety scores. These r's are large enough and exert so much influence on other r's (to be described) that they suggest definitely that manifest anxiety is inversely associated with accuracy of adult judgments of children's social acceptance. This finding is in line with findings of experiments in simpler learning situations, in particular those testing hypotheses of learning theory in conditioning and the more complex paired associate and maze learning situations (*13*). In general terms, the findings of these experiments indicate that college students with high A scores have sufficient motivation to learn a conditioned response more rapidly than have students with low A scores (low motivation). However, the additional drive of Ss with high A scores appears to interfere in some way with the speed of acquiring more complex learning, since Ss with low A scores learn complex tasks more rapidly than do those with high A scores. Neither conditioning experiments nor studies of the A scale have shown as yet whether the "emotionality" measured by the A scale is "chronic" or a "low threshold of emotionality." Such evidence might indicate whether the negative relations found between manifest anxiety and accuracy scores can be explained as due to the influence of a "chronic emotionality" on accuracy of observation, or as due to emotionality aroused in "low threshold Ss" by the judgment task that affects ability to use observation evidence in forming judgments.

As shown in the table, K scores did not correlate with accuracy of judgments of children's best friends. The K factor is usually defined as defensiveness in expressing anxiety and correlates negatively with A scores.

Positive r's in the 0.20 range were found between college entrance examination scores and accuracy scores, as shown in the table. The negative correlation between entrance examination scores and A scores agrees with findings of other investigations using college student Ss (*14*). When the influence of entrance examination T scores was "partialled out" of the correlation of accuracy and A scores (i.e., intelligence was held constant), $r_{\%OA \cdot T}$ was −0.57 and $r_{\%SA \cdot T}$ was −0.58. The respective partial r's controlling the influence of entrance examination GA scores were −0.57 and −0.60. When the influence of A scores was partialled out of the correlation of accuracy scores with both T and GA scores, little or no relation was found between entrance examination scores and accuracy scores. The partial r's were as follows: $r_{\%OT \cdot A} = 0.15$, $r_{\%ST \cdot A} = 0.14$, $r_{\%OGA \cdot A} = 0.08$, and $r_{\%SGA \cdot A} = 0.10$.

The zero relationship shown in the table between class sociometric scores and accuracy scores was changed in direction but not in significance when the influence of A scores was partialled out, since $r_{\%OCS \cdot A}$ was −0.015 and $r_{\%SCS \cdot A}$ was −0.065. The two zero correlations agree with results of two other investigations of the relationship of social acceptance in adult groups and accuracy in judging

Product moment correlations between accuracy scores and scores defining personality characteristics

PERSONALITY TEST SCORES	ACCURACY SCORES		MANIFEST ANXIETY
	Per cent O	Per cent S	
Class sociometric, N = 131	0.10	0.06	−0.24*
Manifest anxiety, N = 117	−0.47*	−0.48*	
K scale	0.00	0.03	−0.29*
College entrance examination, N = 128			
Total	0.25*	0.24*	−0.26*
General ability	0.21†	0.23*	−0.31*
PARI: Composite scales, N = 128			
I. Suppression and interpersonal distance	−0.19†	−0.20†	−0.28*
II. Hostile rejection of the homemaking role	−0.04	−0.12	
III. Excessive demand for striving	−0.20†	−0.35*	−0.26*
IV. Overpossessiveness	0.05	−0.02	
V. Harsh, punitive control	−0.32*	−0.32*	−0.08
PARI: Specific attitude scales, N = 128			
Equalitarianism	0.11	0.14	
Deceit of child	−0.11	−0.12	
Expressing love and affection	0.00	0.08	
Considerateness of husband or wife	−0.15	−0.27*	
Dependency of the mother or father	−0.05	−0.15	

* r is significant at the 0.01 level.
† r is significant at the 0.05 level.

children's social acceptance (*4, 5*). The negative relation between A and sociometric scores has not been reported heretofore, although a similar relation has been reported for children's groups when the Children's Form of the Manifest Anxiety Scale was used (*15*). When the influence of class sociometric scores was controlled, the partial r's of accuracy with A scores were both −0.51.

Negative correlations are shown in the table between two family attitude scores, PARI composite scores I and III, and accuracy scores. These r's were reduced to zero when the influence of A scores was partialled out, $r_{\%OI \cdot A}$ being −0.07, and $r_{\%OIII \cdot A}$ being −0.09. Partialling out I and III scores reduced r's between per cent O and A scores only to −0.45 and −0.44, respectively. Similar partial r's were obtained using per cent S scores. These data suggest that the r's with accuracy scores reported in the table for these two attitude scores are spurious and reflect only the relationship of both factors to manifest anxiety.

PARI composite V scores, for the attitude called Harsh, Punitive Control (of children), had negative relations with accuracy scores when the influence of A scores and entrance examination T scores was controlled in partial r's as well as in the r's reported in the table. The r's with per cent O and per cent S scores remained the same as in the table for both V scores and A scores when either was partialled out. PARI V had a positive r of 0.25 with entrance examination total scores, indicating that agreement with statements favoring harsh, punitive control of children tended to increase as intelligence level increased. This finding disagrees with most of the r's reported by Schaefer and Bell (*10*) between the intelligence level of student nurses and the eight subscale scores included in the composite V score. Control of T scores did not change the negative relation shown in the table between V and per cent O scores, since $r_{\%OV \cdot T}$ was −0.28, and V scores had little influence on the positive relation between T scores and per cent O scores, since $r_{\%OT \cdot V}$ was 0.195.

The Harsh, Punitive Control scale of the PARI combines eight subscales, each made up of five statements and having a point score range from 5 to 20. The subscales are titled: Excluding Outside Influences, Breaking the Will, Ascendance of the Mother, Deification of Parent, Seclusiveness of Mother, Harsh Punishment, Irritability, and Strictness. The mean composite scale score of these Ss was 89, the SD was 11, and the range was from 60 to 127. These data indicate that scores of most Ss fell within the range of either Mild Agreement (10 to 15) or Mild Disagreement (5 to 10) on the eight subscales.

It can be concluded that attitudes favoring harsh, punitive control of children reduced the accuracy of these college students' judgments of best friends of children. These Ss lacked control over the guidance and discipline of the children they judged, a control that most teachers and club leaders possess. Adult control in the nursery school groups observed by these Ss probably would be described as warm, permissive, and democratic, the extreme opposite of harsh, punitive control. Many students throughout both semesters voiced difficulties in understanding and accepting the nursery school guidance of the children, an expression of opinion in line with the PARI V scores. It is possible, therefore, that attitudes favoring harsh, punitive control of children have negative relations with accuracy of judgments of children's best friends only under these conditions, and not those found when teachers and leaders judge the group they teach or lead.

Correlations were not significant between attitude scores on the remaining PARI scales and both per cent O and per cent S scores, as shown in the table.

Analyses of personality classifications. There were no differences in mean per cent O scores of Ss in the categories of socioempathy by an analysis of variance test. This finding is in line with one report (*16*) that the ability to predict one's own social acceptance does not relate to the ability to predict social acceptance of peers.

Mean per cent O scores did not differ for the four semester grade categories in an analysis of variance test. An apparent difference for the two extreme grades, or 59.36 for the 14 Ss with A's and 52.63 for the 19 Ss with D, E, and F grades, was not statistically significant. Much variation in accuracy scores occurred within each grade level. These data do not indicate that mastery of child development subject matter is associated with accuracy in judging children's best friends.

Summary and Conclusions

This study investigated relations between six personality characteristics of the adult and accuracy in judging children's best friends. Ss were 104 women and 27 men enrolled in a college child development course who had observed one of two preschool groups of children for two hours a week for 10 or 11 weeks.

It was concluded that these Ss made as accurate judgments of the children's three best friends, both as observed in play and as chosen on a sociometric test, as have been reported for teachers and club leaders. Accuracy of judgments of observed best friends cor-

related 0.965 with accuracy of judgment of children's sociometric choices.

Relations between scores defining personality characteristics and accuracy of judgments were as follows:

1. Manifest anxiety (Taylor scale) showed correlations of −0.47 or −0.48 with accuracy scores. These r's increased to −0.57 and −0.60 when the influence of relations of college entrance examination scores with both accuracy scores and A scores were partialled out. Additionally, partial r's indicated that relationships with manifest anxiety led to spurious significant correlations between accuracy scores and college entrance examination scores (positive) and between accuracy scores and two PARI composite scales of attitudes toward family life (both negative).

2. Attitudes favoring harsh, punitive control of children reduced the accuracy of these college students' judgments of social acceptance of children. The r of −0.32 between scores on this PARI composite scale and accuracy scores was not changed markedly when either anxiety or college entrance examination scores were partialled out. The Ss had no control of the warm, permissive nursery school guidance of the children they judged; the relationship between this attitude and accuracy scores is possibly specific to judgment under these conditions.

3. No relationships were found between accuracy of judgments of children's best friends and social acceptance in peer groups, socioempathy (predicting social acceptance of self), the K scale, semester grades in a child development course, and the attitudes toward family life expressed on the PARI scale that are not concerned with type of control of children.

The relationship found here between manifest anxiety scores and the accuracy of adult judgments of children's best friends is important, not only because of the size of the negative correlation but because manifest anxiety is the only characteristic of adults, other than similar accuracy in judging social acceptance of peers, that in four investigations using different Ss has been found to relate to the great variability in the accuracy of adults in judging children's social acceptance.

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Nutrition Conference Invitation

The Fourth Annual Nutrition Conference, sponsored by Wayne State University College of Medicine, will be held on Thursday evening, April 24, and on Friday, April 25, 1958. Speakers on the general subject "Proteins and Amino Acids in Nutrition" will include F. E. Deatherage of Ohio State University, C. A. Elvehjem of the University of Wisconsin, E. E. Rice of the Research Laboratories of Swift and Company, and N. S. Scrimshaw of the Pan American Sanitary Bureau (Guatemala). Members of the American Home Economics Association are invited.

Procedures used in the study of effects of wear and in the judging of a selected group of children's garments during several months' wear are presented in the following paper which will interest other research workers contemplating similar studies.

How to Study Consumer Satisfaction with Children's Clothing Made of Different Textile Fibers[1]

Emil Jebe, Elizabeth Beveridge, Glenn R. Hawkes, Fannie Potgieter, and Opal Roberson

The authors are all members of the faculty of Iowa State College. They are attached to the statistical laboratory, the departments of household equipment, child development, textiles and clothing, and to the Home Economics Extension Service, respectively.

THIS report describes the design features of one study on consumer satisfaction with children's clothing. Although part of the material presented is somewhat specialized for this project, most of the principles, concepts, and ideas reported are quite general in application to studies of this type. The report emphasizes the statistical problems encountered in trying to assess the nature of the consumer preferences and satisfactions. It is hoped that this description of the study will stimulate discussion and bring forth suggestions for undertaking complex studies of this kind. Detailed results of the study are presented elsewhere (*1, 2, 3, 4, 5*).

The purpose of the study was to investigate the relative merits of fabrics made of various textile fibers. In particular, it was desired to compare these fibers in terms of consumer acceptance and the maintenance and care required when these fibers were made up into children's clothing. Generally, the fibers used in these fabrics may be referred to as natural (N) and synthetic (S) or man-made fibers. Laboratory tests were not considered in this study; only actual wear by children under home conditions was studied. Thus, the project might be considered a field test to evaluate factors not observable in the laboratory. It was expected that the information obtained would be valuable to the sponsor[2] in marketing his products and valuable to the Station[3] in terms of advice to be given consumers through information and extension services.

Co-operating Subjects

A population of co-operating subjects was obtained through the department of child development. In order to get a broad picture of the wear and care problems, children of both sexes of ages 5, 8, and 10 years were selected. Arrangements to co-operate were completed with the parents of 66 children, 33 boys and 33 girls, with 11 in each age group. The parents agreed to have children wear the clothing supplied and to keep necessary records. In return for this co-operation the clothing was furnished without cost.

Factors to Be Investigated

Upon completion of the arrangements for co-operating subjects, the statistical laboratory was asked to set up a design for the test program and to assist in devising record forms and procedures. The first question was, "which of the factors that are of interest to the research workers in this area can be included?" *Factors* are considered here from the "design of experiments" point of view. The available experimental units clearly were the 66 children which could be divided into six age-sex groups. These six groups were considered as strata. The 11 units or children in each stratum were not representative of any general population, but this is not serious since the children are analogous to the plots available to the agronomist for

[1] Journal Paper No. 3285, Iowa Agricultural and Home Economics Experiment Station, Ames, Iowa, Projects of the Statistical Laboratory, S-113, and Home Economics Research, 1272, "Family attitudes toward care and maintenance of children's clothing."

[2] The research work presented in this report was supported in part by a research grant from the E. I. du Pont de Nemours and Co., Inc., Textile Fibers Dept., Wilmington, Delaware.

[3] The Iowa Agricultural and Home Economics Experiment Station is referred to as the Station.

his experiments. One difficulty, however, was that some families had more than one child in the test program. This undesirable situation—experimental units not independent—was overcome as indicated below.

Principal interest centered upon the N and S or the contrast between garments made of natural and man-made fibers. Since each child was to be furnished a "complete set of garments" made of each category of fibers, these two main treatments were applied to all the experimental units.[4] Thus, each child in a sense formed a main plot with observation on the N or S garments to be regarded as values for sub-plots or split-plots.[5] Randomization for the N and S treatments then entered in the choice of order of wearing of the garments.

Because laundry methods of homemakers would be quite variable under home conditions, it seemed desirable to impose some form of experimental control on the laundry methods used on the garments being tested. This was done by laundering some of the garments under so-called "controlled" or "uniform" conditions. Thus, the direct effect of laundry methods as well as the interaction with type of garment (N or S) could be evaluated. The controlled laundering for certain randomly selected children was done in a household equipment laboratory. Garments for these children received a uniform laundry treatment (designations L_H and L_C for laundry-home and laundry-college were used to describe these two groups). Experimental units or families on laundry-college were further designated as L_{CA} and L_{CT} to indicate type of washer used in the laboratory. Little control could be imposed over the home laundry situations. A census was available, however, for the families of the 66 children listing their laundry equipment and techniques. Considerations entering into the design to be described below made it convenient not to utilize records for certain atypical home laundry situations.

Measurement of the Factor Effects

It was immediately clear that both objective and subjective measurements would need to be made. Records of actual time (or money) spent in laundering, cleaning, pressing, or mending were to provide objective records on care and maintenance. Such records alone, it was believed, would not provide sufficient information. It seemed that in real practice a mother would answer this subjective question each day she sends a child to school, "Is this garment in suitable condition for my child to wear to school today?" If each garment could be rated in some manner with respect to this question it was thought this would provide a measure for evaluating the factors introduced into the test program. As a preliminary step, a group of well-trained (home economics degree) homemakers were asked to judge a set of children's garments. This pre-test was intended to give a comparative evaluation of a group of seven judges and to measure each judge's repeatability in judging the same garment twice. Children's garments, 28 in number, in various stages of wear were borrowed from local families for use in this pre-test. Four garments were randomly assigned to each of seven tables. With seven judges, seven judging periods were required for each judge to rank each garment on a five-point scale.[6] Then, the garments were re-randomized on the tables and the routine repeated. For this scheme, the assignment of tables as columns, judging periods as rows, and judges as treatments in the cells of a 7 x 7 Latin square formed a convenient plan or design for accomplishing this pre-test judging. Differences were noted among the judges in an absolute sense on the five-point scale, but repeatability on the same garment was good for all the judges tried.[7] The latter may

[4] The complete set of garments consisted of one N and one S garment as follows:

AGE	BOYS	GIRLS
5	Snowsuit Dress shirt Trousers Shorts (4 pr) Sox (4 pr) Sweater Sport shirt	Snowsuit Skirt Dress Panties (4 pr) Sox (4 pr) Sweater Slip-blouse
8 to10	Same as for age 5 except snowsuit omitted. Light jacket added for age 8. Heavy jacket added for age 10.	Same as for age 5 except snowsuit omitted and slip added for ages 8 and 10.

[5] Refer to W. G. COCHRAN and G. M. COX, *Experimental Designs*, 2d Edition. John Wiley and Sons, New York, 1957.

[6] The preliminary test scale used was (a) Entirely Satisfactory, (b) Adequate, (c) Fairly Satisfactory, (d) Hardly Satisfactory, and (e) Not Satisfactory.

[7] For brevity the results of this preliminary judging of non-test garments are omitted. Numerical values of 5, 4, 3, 2, and 1, respectively, were assigned to the scale listed in footnote 7. Application of the analysis of variance showed differences among the judges. About 80 per cent (78.6 per cent) of the repeat judgments on the same garment were considered similar, i.e., zero difference on

have been due partially to wear differences among the garments in the trial lot. From this preliminary trial, it was concluded that a group of competent judges using a suitable rating scale could provide useful information for comparing the factors; for example, total or mean "scores" could be compiled for each garment of N or S type. With these measurement procedures agreed upon, it remained only to design a plan for the wear program which would permit straightforward analytical procedures, based on the analysis of variance,[8] to be applied to the large volume of data to be collected.

Since weather conditions are often variable over short-time periods, the weather might cause differential effects on the two types of garments. If all the test subjects were wearing, say, N garments in one week and then S garments in the next week, comparisons of the fiber types would be confounded with the environmental conditions of the test period. Thus, it seemed wise to control on the weather factor by starting one-half of the test subjects on N and the other half on S garments the first week of wear and then alternate by weeks as follows:

Group (1) N-S-N-S . . . . . .
Group (2) S-N-S-N . . . . . to the end of test period.

Structure of the Test Program

Now, a picture of the assignment of the factors to the experimental units may be given by concentrating attention on a single age-sex stratum. As noted above, 11 children were available in each stratum. Clearly, the starting on N or S the first week could not be balanced in each stratum. The main plot treatments to be assigned were L_{H}, L_{CA}, and L_{CT}. If 12 children had been available, four replicates could have been set up in each stratum. Three replicates could be formed, leaving only two extras to replace possible drop-outs, but this arrangement was not suitable because two-thirds of the laundry burden would be placed on the laboratory laundry. Since it was desired to split the subjects about evenly on L_{H} and L_{C}, a single "replicate" was then set up as L_{H}, L_{H}, L_{CA}, and L_{CT}. These four main-plots were assigned at random to two separate groups of four children that were considered to be homogeneous. Homogeneity was established on the basis of the census of laundry equipment and techniques.

Formation of these two replicates left three children unassigned in each stratum. Assignments of these children were based on the following considerations. First, one could be used to replace a child who might drop out.[9] Second, it was found to be convenient to use garments from one of the extra children for repeat judging to keep a check on the performance of the "consumer judges." Further, in those cases of more than one child in the same family entered in the experiment, it was decided that the mother should not be subjected to more than one treatment for all children entered. Hence, when one child of such a family was assigned by randomization to a specific treatment all others in the same family entered in the experiment were assigned to the same treatment. In such cases, the statistician endeavored to put all such non-random assignments into this group of three extras in each stratum to maintain statistical independence of subjects used in the experiment. Other assignments to the extras group were based on the census showing atypical laundry equipments.

In reality the treatments were assigned at random to eight children, but the formal subdivision into two replicates was maintained for organizing the judging programs. The 11 children in each age-sex stratum were then assigned in this way:

	Replicate 1			
Child Number (Main Plot)[10]	(1)	(2)	(3)	(4)
Odd week	NL_{H}	SL_{H}	NL_{CA}	SL_{CT}
Even week	SL_{H}	NL_{H}	SL_{CA}	NL_{CT}
	Replicate 2			
Child Number (Main Plot)	(5)	(6)	(7)	(8)
Odd week	SL_{H}	NL_{H}	SL_{CA}	NL_{CT}
Even week	NL_{H}	SL_{H}	NL_{CA}	SL_{CT}

plus three with one chosen at random to follow the program of child (1), another chosen to follow the program of child (2), and a random choice of one the same as (3), (4), (7), or (8) above. The first letter, N or S, indicates which group of garments was worn in a week of the test program. Records for the principal comparisons were to be

the scale or a difference of plus or minus one. Over the entire pre-test, the correlation between ranks of the scores for each garment (summed over the judges) was surprisingly high, $r(\text{ranks}) = 0.99$.

[8] Refer to G. W. Snedecor, *Statistical Methods*, 5th Edition. Iowa State College Press, Ames, Iowa, 1956.

[9] Actually, only one child out of 48 was "lost" during the wear program.

[10] Note the child is the main plot while the split-plot is the period of wear of N or S garments by the individual child.

analyzed, however, for only a total of 48 children, eight from each stratum.

The Judging Procedures

Next, the number of judgings by a panel of consumer judges and the procedures to be used had to be worked out. The purpose of the judging as indicated above was to give each garment a subjective rating in relation to the question "Is this garment in suitable condition for my child to wear to school today?" Though it seemed highly desirable that the two test garments, N and S, belonging to the same child should be presented to a judge at the same time for judging, this was not done for all judgings. In order to do this *all* garments for some subgroup of children would need to be collected—that is, called in and removed from the wear program for a period of one week. Due to the delay in getting the test program started, it seemed unwise to shorten the total wear time available (to end of school year).

Hence, a judging program had to be designed which would be balanced with respect to all treatments and amount of wear time for each garment. Fortunately, the alternation set up for the wearing of the N and S garments made possible this balance. It was decided to conduct three judgings of the garments, one in February, one in April, and the final one after completion of the wear program at the end of the school year.[11] A single judging program was set up to cover two weeks. One-half of the test garments were called in the first week and the remaining half the second week. The first week was chosen so that if the N garment came in for judging (that is, S garment being worn by the child in that week), then the matching S garment would be judged the following week with both garments having received the same number of weeks of total wear time.

In designing the judging sessions a few principles were established that seemed reasonable to the statistician and the home economics workers. These were as follows: (1) A single judge should be exposed to only a limited number of garments in a single judging period. (2) Each garment should be rated by itself, without respect to condition of other garments presented to the judge at the same time (if both N and S garments from the same child had been available at the same time for judging, the judge could have been asked to make a direct comparison). (3) In a single judging period all garments to be judged by one judge should be the same, for example, all sweaters or all slips. (4) In two successive judging sessions some of the same garments should be included in both sessions. This procedure would permit keeping a check on each judge's performance from the duplicate ratings on the same garment. It might be asked, "How did you keep judges from knowing about this check on their performance?" The judges were not completely "fooled" by the procedure—they were aware of some repetition in garments presented to them. Yet an elaborate record-keeping scheme, either mental or written, would have been required for a judge to try to produce duplicate ratings for the garments judged twice. Of course, no written records were permitted. The difficulty may be appreciated by noting that each garment was labeled with a code, 35 garments were usually judged in each session, positions of garments were randomized on each table, and garments were re-randomized as to which garment would be assigned to a given table in each session. Occasionally, however, a judge could identify a particular garment judged the second time by color, stain, loss of buttons, or wear.

For the design of a single judging session, the 7 x 7 Latin square was again found to be a convenient device for arranging the program. Tables on which the garments were to be placed were designated as columns of the square and judging periods as the rows with judges assigned to the cells in the square. Randomization for the squares followed the usual procedures.[12]

The various garments issued to each of the children usually made it possible to place a different garment on each table. Sometimes only six garments were available for a stratum so one table was then left empty (such a layout is a Youden square). When eight garments were available, two garments were placed on one of the tables; the smaller items such as sox and shorts or sox and panties were grouped separately on the same table. Of these smaller items, each child possessed four pairs. To save time and simplify the judging, all four pairs were not judged; a single pair of those collected was randomly chosen for placing on the designated table.

One replicate from a stratum was judged in each judging session. Thus, four garments of the same kind were placed on each of the seven tables.

[11] The test program was started in December of the school year.

[12] Refer to FISHER and YATES, *Statistical Tables . . .*, Oliver and Boyd, London, 1948, and O. KEMPTHORNE, *Design and Analysis of Experiments*, John Wiley and Sons, New York, 1952.

Garments from a fifth child were added to each table from one of the available extra children in each stratum. These garments from the fifth child were then judged twice, that is, in successive sessions, by placing them on their randomly assigned tables in the next of the two sessions required for one stratum. Garments were also randomized in their order on the tables for each session. The judges were instructed to proceed always from left to right in judging the garments on a table. In choosing the order for judging the strata and replicates within a stratum, randomization was also applied. Since there were 6 strata, 12 sessions (using 12 Latin squares) were required to complete the judging in one of the two weeks in each of the selected months. At first, two full days were required to complete 12 sessions, but in later months the judges speeded up and somewhat less than two days was required.

The actual form used by the judges for the rating was arranged as follows:

JUDGES CODE____ DATE_____ STRATUM_____	ENTIRELY SATISFACTORY	SATISFACTORY	FAIRLY SATISFACTORY	HARDLY SATISFACTORY	NOT SATISFACTORY	COMMENTS
Garment e.g. Snowsuit	1					
	2					
	3					
	4					
	5					
Sweater	1					
	2					
etc.	3					
	4					
	5					

The judges were instructed to place a check in one of the five columns for each of the five garments on a table in relation to the question previously stated about condition of the garment for wear to school. Comments could be added for any garment if the judge wished to describe the condition of the garment as it affected her rating. An attempt was made to give the judges a uniform frame of reference by showing them new sets of unworn garments before judging began.

In addition to the judging program as described above, it seemed desirable to do some judging in which a judge would be comparing matched garments, N and S, from the same child. This idea was expressed earlier but not incorporated in the program because it would reduce the wear period. At the end of the school year, all garments were available before their return to the children for permanent possession. Hence, a limited program was set up to study the judging of paired garments. After studying the problem of organizing a judging session it seemed best to place six garments consisting of three matched pairs on one table for presentation to a judge in one period. It was decided to use one child from each of three strata of the same sex to provide the three pairs. Next, the four children in one replicate in a stratum plus an extra child to introduce the duplicate judging feature would make necessary five tables. This requirement suggested that a 5 x 5 Latin square would provide a convenient plan for organizing a session: tables as columns, periods as rows, and five judges assigned to the cells. This structure, while designed to accomplish a similar result, is quite different from the preceding program. In the regular February, April, and June judgings, all garments for five children arranged over seven tables were judged in one session; in this matched garment judging, the two N and S garments from each of 15 children were judged in one session. From some points of view, this latter program had advantages over the former; that is, matched garments were compared, and the same or similar garments appeared on all tables so that these garments were judged under more homogeneous conditions.

The form used for this matched garment judging was arranged as follows:

GARMENT	TABLE NUMBER	TREATMENT	JUDGE	DATE	SEX

	WHICH GARMENT RANKS HIGHER IN GENERAL APPEARANCE?	WHICH GARMENT SHOWS LESS WEAR?	WHICH GARMENT HAS HAD BETTER CARE?	WHICH WOULD YOU CHOOSE FOR YOUR CHILD TO WEAR TO SCHOOL?
Code___1 Age___2				
Code___3 Age___4				
Code___5 Age___6				

The judges were asked to start at the left at each table and compare the first two garments, then the next two, and then the last two. Randomizations of age, position, and of N and S garment position on each table were used to help secure unbiased results.

Discussion

The study program was carried out as described above. It appears that the structure of the design was operationally suitable and that the judging programs and procedures employed produced useful and reasonably satisfactory results.

With respect to care and maintenance, certain of the S garments showed a considerable advantage. The study revealed great variability in home laundry practices and results. In terms of preferences as expressed by the consumer judges the results were mixed. For some garments, the S fibers were definitely preferred while for others the N fibers were strongly preferred. This statement is not to be taken as a general conclusion for these garment situations. At least part of the observed differences, of either sign, N better than S or S better than N, appeared to be attributable to innate quality differences in the test garments. Disregarding prices, an effort was made to secure the best garments of each type, N or S, that would be suitable for children of these ages to wear to school. Market availabilities, it is believed, introduced quality differences for some garments. A notable example was the girls' N sox which were consistently rated higher than the S sox. The table, condensed from (5), gives a partial summary of the results.

Mean ratings for selected N and S garments and standard errors of the mean differences, co-operative clothing study, Ames, Iowa, 1955

GARMENT	N MEAN*	S MEAN*	STANDARD ERROR OF DIFFERENCE†
February consumer judging			
Boys			
Trousers	31.5	30.9	0.83
Sox	26.5	26.7	1.63
Girls			
Snowsuits	16.8	26.8	0.64
Sox	25.2	19.4	1.47
June consumer judging			
Boys			
Trousers	29.2	28.2	1.41
Dress shirts	24.2	26.0	1.49
Sport shirts	30.6	31.5	0.95
Sox	23.3	27.2	1.55
Girls			
Skirts	27.3	25.2	1.18
Dresses	28.7	24.9	0.82
Sox	26.6	22.4	1.30
Panties	27.5	28.8	0.83

* A single observation for forming a mean was the sum of the individual ratings assigned by seven consumer judges to a single garment. Numerical values given the ratings were as listed in footnote 8 above.

† Approximately, a difference, plus or minus, exceeding in absolute value twice its standard error may be judged significant at the 5 per cent level.

The selected results presented in the table are illustrative of the kinds of results obtained. It may be noted that girls' S snowsuits were strongly preferred (also true for boys') and that boys' S sox were preferred in the June judging. On the other hand, N garments were preferred as already noted for girls' sox and for the girls' dresses. Inspection of the original judging records indicated that this last preference was due largely to a discounting of S dresses because the originally white collars picked up color under normal laundry conditions, laboratory or home.

It is believed that conscientious trained consumer judges can be used in complicated problems of this type to help evaluate the factors under test and give a measure of consumer preferences. Care must be taken in the statistical planning and taking of the judges' observations. When this is done, possible biases should be reduced; factors that cannot be eliminated may be balanced; and results of adequate precision should be attainable. A procedure that maintains a check on the judges' performance appears to be a desirable feature of such programs. It is interesting to note that about two-thirds of the repeat judgments for the seven judges used in this study were identical; also, somewhat less than 5 per cent of the repeat judgments differed by only 2 or more units, plus or minus, on the rating scale used. Analyses showed the period and Latin square effects to be small usually, that is, the judges maintained a fairly uniform frame of reference for the judging days.

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Can you help the Camp Fire Girls? Thousands of young girls would like to join this educational-recreational group, but not enough leaders can be found to meet their needs. Can you help?

Those Mysterious Theses

Patricia Cubbon

Miss Cubbon is a senior at West Virginia University. She is studying to be a teacher.

THE word "theses" to the pre-college student or even the undergraduate brings to mind something bordering on the mysterious—the unknown at any rate. For some time, I had been aware that copies of many theses were available at the University library, but I had never had occasion to read them. Although I have yet to read a complete thesis, reading abstracts of 21 theses in the booklet "Master of Science Theses in Home Economics Education" has given me an idea of what to expect. I remember hearing my father speak of his thesis, but I had never seen it and was under the impression that once written, a thesis was of no further use to anyone. I consider myself fortunate that this misconception has been cleared away.

I have come to understand the thesis and its purposes more clearly. I can see it as a means of analyzing and evaluating situations and of crystallizing the conclusions of research. The result of this work, a thesis, is made available to anyone who will take time to read it.

From reading abstracts of theses I can see that reading a thesis on home economics education can be a help in many ways to both the home economics teacher and to the student. It can help make a teacher more aware of problems, not only those in her classes at a particular time, but those that might appear in the future as well. The thesis may provide the teacher or any home economist an opportunity to re-examine the wide scope of her field. It may provide numbers, statistics, or other information that will clarify a puzzling situation. The author's conclusions might be put to good use by the reader in such things as planning curriculum, building new units, and bringing methods and techniques up to date. All these points will be well to consider and put to use once I am teaching. However, theses abstracts are of immediate use to a college student, too. Theses abstracts on home economics education contain facts and suggestions with which the college student may supplement her texts. For example, there are methods suggested for child care activities; personal grooming; and time, energy, and money management. Each contains pertinent facts. The abstracts are brief, condensing important points and omitting less pressing issues. Then, too, the reader has an opportunity to become familiar with the names of home economists throughout the state. I was pleased to find that I already knew a few of the names. I also noted that the theses were keyed to my state, making the data even more pertinent.

Patricia Cubbon looks at a thesis in the library. She recommends theses as valuable undergraduate reading.

Reading the abstracts in "Master of Science Theses in Home Economics Education" has whetted my curiosity and pointed out the effectiveness of intensive study. I feel more strongly than ever the need for more graduate study and am considering the possibility of doing such work myself. At last I see theses as worth-while and currently applicable pieces of information.

What the Home Economics Club Means to Me[1]

Ruth Turnage

Miss Turnage is a senior at East Carolina College, Greenville, North Carolina, and is the president of her college home economics club.

WHAT does the home economics club mean to me? Is it merely an organization for which I hold a membership card, a means to get my picture in the yearbook? Or is it really a club in which I use my time, talents, and labor to foster the interest and development of home economics? I sincerely trust it is the latter.

What does your home economics club mean to you? Is it a group in which you find much enjoyment? Is it an organization in which you work to help others, to foster international good will, to become a good citizen and community leader, to develop professional abilities, and simply to learn to live with others?

To me, the East Carolina College Home Economics Club has been a doorway providing many opportunities to help me become a well-rounded individual. When I entered college, I immediately became a member of the club. It was only a few days before I was appointed to serve on the refreshment committee and found myself busy helping to plan the club's parties and refreshments for various meetings. Working on this committee gave me the chance to meet other home economics majors and helped me develop socially by working with others and sharing their experience and ideas.

As a sophomore, I served as co-chairman of the refreshment committee. I not only furthered my experience in foods by preparing and serving the refreshments, but I also gained experience in acting as hostess to the group.

Our club meetings have consisted of a variety of interesting programs. One of these was a panel discussion on "What Home Economics Offers You." The panel was composed of a home demonstration agent, a teacher, a home economist on TV, a power and light company worker, a dietitian, and a homemaker. This is just one of the many ways in which the club has helped to supplement my class activities.

Our club makes contributions to many organizations, including the AHEA International Scholarship Fund, CARE, Red Cross, and the Cancer Society. At Christmas we adopt a needy family and give them food, clothing, and toys. We are the only Santa Claus some of these families know. Having a part in sharing with others, especially those less fortunate than ourselves, is a wonderful and rewarding experience.

At a careers conference, Ruth Turnage, right, tells a high school student the advantages of home economics.

Perhaps you think that what I say sounds fine but that everyone can't be a committee chairman or an officer in the club. That is quite true, but holding an office is only one part of club work. There are many other jobs to be done and plenty of opportunities for you to serve your club.

It is to you—home economics club members—that I offer a challenge to take an active part in your club's activities. An organization with inactive members is like a plane with only one good wing. The damaged wing prevents the plane from rising and making a successful flight. Likewise, in a club, inactive members prevent the club from making a successful flight and accomplishing its purpose. The home economics club needs you. But far more important is the fact that you need the club, because you need the challenge of learning to serve yourself, your family, your community, and your nation.

This is what the home economics club means to me. Will you work to make yours mean the same to you?

[1] Adapted from an article in the magazine of the North Carolina Association of Future Homemakers of America.

International Congress Registrations Received from Twenty-three Countries

To date, participants from 23 countries have registered for the Ninth International Congress on Home Economics to be held on the campus of the University of Maryland July 28 to August 2, 1958. AHEA members who wish to attend the Congress are urged to file applications with the Congress Director at the AHEA headquarters in Washington as soon as possible. Registrations from the United States already include participants from 46 states, and well over half of the total number of Congress registrations reserved for AHEA members have already been filled.

The week-long Congress is being arranged by the AHEA and the Canadian Home Economics Association, who are the hostesses for the meeting, and by the International Federation of Home Economics. The program will include speakers from all parts of the world, professional trips in and around Washington, D.C., opportunities for informal professional contact with colleagues from other countries in small discussion groups and at social occasions during the week, as well as educational exhibits set up by the participating countries.

During February, each Congress registrant was queried about professional trip and discussion group choices, and each was sent a copy of the 409-page volume of the preliminary reports received from 12 of the participating countries. Additional copies of the volume of reports will be available from AHEA for $2 after the Congress. Included are all reports in English, one in French, and one in German, and 1500- to 2000-word résumés in French, German, and Spanish.

Procedure for Congress registration for AHEA members is to request application blanks from the Congress Director, AHEA Headquarters, 1600 Twentieth Street, N. W., and to return the forms with payment of the $35 registration fee and payment for housing and meals at the University ($32 or $34.50, depending on arrival date) to the Congress Director at AHEA at once. Applications are being accepted in the order received until the total AHEA quota of 600 registrations is filled.

What Is My Commun-I-Q?

JEANNE PARIS
Director of Home Economics
Swift and Company, Chicago, Illinois

Miss Paris was one of the AHEA representatives at the Conference on Communications sponsored by the National Project on Agricultural Communications at Gull Lake, Michigan, in October. This check list sprang from a quip at the Conference and was developed from the idea that one's appearance and attitude make a first and important impression on young women. There is no attempt to evaluate professional adequacy with such a check list.

In a business where there is a product involved, one of the best sales tools is a satisfied customer. In a profession such as home economics, a superior recruitment tool is the owner of a home economics degree who communicates to others the satisfactions gained from her education for living. This is a personal matter that is transferred to others in the way she walks and talks, her attitudes, her skills, the hat she wears, the time and interest she has for the people around her . . . her family, co-workers, students or customers, friends.

It is easy enough to point one's finger figuratively at another and think that she does little to encourage bright young women to be interested in home economics. Perhaps each of us should, as a home economist, take stock of *ourselves* occasionally to check on the effectiveness with which we communicate to others the advantages of being a home economist.

Ask yourself this question—WHAT IS MY COMMUN-I-Q? Then check your Commun-I-Q by answering these questions:

COMMUN-I-Q QUIZ

	Yes	*No*
Do I give the impression to others that I am happy and interested in my job?	____	____
Do I greet others with "hello" or "how are you" and really mean it?	____	____
Do I have good posture?	____	____
Are my clothes pressed, brushed, cleaned?	____	____
Does what I wear look planned-to-go-together rather than as if it were the only thing that didn't have a button missing?	____	____
Do I look in a full-length mirror before I leave the house in the morning?	____	____
Do I see someone in the mirror that looks well-groomed?	____	____
Do I have a little gimmick to wear occasionally to keep others interested in what I do, such as tiny strawberry earrings in May if I am discussing seasonal fruits?	____	____

Does my new hat give a "lift" to others as well as to me?	___	___
Do I practice what I teach?	___	___
Do I exemplify good nutrition?	___	___
Do I practice calorie control?	___	___
Do I select a well-balanced lunch after teaching or writing about menu-planning?	___	___
Do I wear a well-matched plaid skirt, dress, or blouse while teaching how to match plaids?	___	___
Do I keep my fingernails manicured and neat after teaching grooming lessons?	___	___
Do I keep personal accounts and budget funds to my satisfaction while teaching others to do it?	___	___
Do I use good time and energy management for myself at work and at home?	___	___
Have I applied good art principles in planning the furnishings for my home?	___	___
Can I bake a good pie or cake after writing a recipe or giving a demonstration for others to follow?	___	___
Am I a gracious, relaxed hostess because I have pre-planned and organized in advance?	___	___
Have I contributed time and service to my community lately?	___	___
Have I given a boost to my profession so far this year?	___	___
Have I read a good book not associated with my work lately?	___	___
Do I have a hobby not associated with my work?	___	___
Has a girl recently asked me what she should do to have a job like mine?	___	___

If after answering all of these questions, you have a "yes" after each one that concerns you and your job, you have won our Communi-I-Q game. You are unique. Most of us must honestly answer "no" to several of the questions. Undoubtedly our transmission score is low. Let's realize that interesting others in home economics is an everyday affair not to be left to the other fellow!

Gift from Connecticut Association Aids Landscaping at Headquarters

Connecticut laurel, a new magnolia tree, wax-leaf Ligustrum hedge, and other foundation planting were set out around the AHEA headquarters building in Washington during the winter. Part of this landscaping was made possible by a gift from the Connecticut Home Economics Association. The new planting adds much to the attractiveness of the small grounds on the Twentieth Street front and Q Street side of the building. The AHEA building is to be on the list of professional trips for the International Congress on Home Economics next summer.

International Seminar Invites United States Home Economists

Members of the American Home Economics Association visiting Europe next summer are invited to attend an International Seminar on Methods and Program Planning in Agricultural and Home Economics Extension to be held at Wageningen in the Netherlands July 7 to 31, 1958. The Seminar is organized by the International Agricultural Study Center.

Mrs. C. W. Willinge Prins-Visser, vice-chairman of the organizing committee, sent the following explanation of the Seminar with the announcement for the JOURNAL:

Since 1953 there has been held an annual international seminar on methods and program planning in agricultural extension. This seminar is located at the Agricultural University at Wageningen, the Netherlands. Though the accent of the seminar was on agricultural extension there were always a few Home Economics extension workers attending. Moreover, Home Economics Extension in rural areas is often closely related to agricultural extension. Therefore the organizing committee felt that more attention should be given to the field of Home Economics Extension.

As a consequence, the subject of the 1958 seminar will be: Methods and program planning in Agricultural and Home Economics Extension. A part of the program will be organized for agricultural advisors and Home Economics advisors together. The other parts will contain special agricultural and home economics subjects. The F.A.O. will cooperate in this seminar by sending one of the officers of the Home Economics section as a consultant. There will be simultaneous translation which makes it possible to follow the lectures in German, French or English. In addition there will be a number of discussion groups, each using one of these languages. Objects of agricultural as well as Home Economics interest will make up the program of field trips and excursions.

Total fees for the Seminar will be approximately $206. Persons planning to participate are requested to communicate with The Director, International Agricultural Study Centre, 1 General Foulkesweg, Wageningen, the Netherlands.

Nominations Invited for Carol Lane Traffic Safety Awards

The National Safety Council invites nominations for the 1957-58 Carol Lane Awards which the Council administers through a grant of the Shell Oil Company. The Awards recognize and reward women's achievements toward the preservation of lives through traffic safety programs in their community or state. For further information and entry blanks write to Miss Alice Catherine Mills, Director of Women's Activities, National Safety Council, 425 N. Michigan Avenue, Chicago 11, Illinois.

June 15 is the closing date for nominations.

Abstracts of Doctoral Theses Related to Home Economics, 1956-57

Following are abstracts of doctoral theses in home economics presented, in most cases, during the academic year 1956-57. The selection of abstracts was made mainly from titles of 1956-57 theses in home economics and related fields as compiled by the Institute of Home Economics of the Agricultural Research Service, U.S. Department of Agriculture, and the Home Economics Education Branch, Office of Education, U.S. Department of Health, Education, and Welfare. All AHEA members included in the list were invited to submit abstracts. With each abstract is the title of the thesis, the name of the author, and the name of the college or university that awarded the degree. Some abstracts are not included here because longer articles or other uses of the material either have been made or are in preparation.

Education

Education of Home Economics Teachers Preparing to Guide Home and Family Life Education in the Elementary School Program, L. ANN BUNTIN, *Teachers College, Columbia University.*

This study is concerned with the home economics education program in one particular teacher education institution, the State University Teachers College, Plattsburgh, New York. Home and family life education in the school today, the role of the home economics teacher, the teacher education curriculum, and the implementation of home and family life education in the campus school at the College—these topics were considered in relation to increasing the effectiveness of the pre-service education of the home economics teacher preparing to work in the elementary school.

Four school systems were visited and ways in which education for home and family life is included in elementary school programs were studied. In each school, administrators and home economics and elementary teachers were interviewed and class situations observed. Interviews were held with teachers responsible for guiding programs of home and family life in elementary schools not visited and with officials of the state department of education.

On the basis of the assembled body of information, modifications were proposed for the home economics education program at the College. Modifications were considered in light of the increasing tendency to see the role of the home economics teacher in the modern elementary school as that of consultant. Thus the teacher's major efforts should fall into the following categories: (1) developing and guiding a program in home and family life education which can become part of a well-unified program, (2) developing good working relationship with classroom teachers, (3) assisting with learning situations in and out of the classroom as teacher, guide, observer, or evaluator.

Since many educational experiences are equally important to all home economics teachers, a single curriculum is recommended with adequate variations to enable the student to prepare for a specific job and at the same time avoid narrow specialization.

Forty Years of Home Demonstration Work in Texas, 1915-1955—An Educational Movement in Texas, KATE ADELE HILL, *Texas Woman's University.*

Beginning with the first result demonstration in improved methods developed on the Walter Porter farm, near Terrell, Kaufman County, Texas, in 1903, directed by Seaman A. Knapp, and including the historical background and the enactment of the Smith-Lever law in 1914, this thesis records and interprets representative activities of the home demonstration phase of agricultural extension work.

Home economics as applied in farm and ranch homes of Texas by homemakers and their daughters in 4-H Club work preceding and following the appointment of Mrs. Edna W. Trigg as the first county home demonstration agent in Texas in 1915 is discussed with significant results related in terms of better family living. The areas included are foods, clothing, interior and exterior home improvement, home industries, family life education, organization of home demonstration clubs and the Texas Home Demonstration Association, and recreation. The story of home demonstration and 4-H work among Negro families is related.

Response of the rural population of Texas to home demonstration work is traced by representative recorded results from the first efforts to introduce the work through four decades of growth from 1915 to 1955.

The county home demonstration agent is portrayed as a professional home economist who has a county for a laboratory. How she works, her training before and after employment, and her relationship to the Agricultural and Mechanical College of Texas, the U.S. Department of Agriculture, the Extension Service staff, and the people of the county are explained.

An Expanding Concept of Junior High School Homemaking Programs in the Western States, ARLEEN C. OTTO, *Teachers College, Columbia University.*

This study was designed to explore creative ideas and emerging practices in home and family life education for early adolescent boys and girls.

Twenty-five program descriptions were obtained where unusual and/or experimental administrative organization, homemaking facilities, and methods were currently operating. Forty educators were asked for their thinking about what home and family life education could become if all the time, money, and talent necessary were available.

Data collected indicate that some homemaking programs are exploratory in nature and a part of general education. Skills in personal and social relationships are becoming as important as some manual skills. More boys, especially seventh graders, are receiving homemaking instruction at school. Flexibility of instructional time was found in some of the patterns located. Homemaking education is being taught in self-contained classrooms, but the majority of the facilities are multipurpose and all-purpose classrooms. Homemaking education is often scheduled in a nine weeks' block for seventh grade boys and girls. Titles of these courses are changing to Home Living, Citizenship in the Home, Home Arts, and others indicating the nature of the courses. Most junior high homemaking courses are required. Classes for seventh and eighth grade students are large, averaging 28 to 36 students.

In addition, the study contains a look toward the future in home and family life education drawn from the compendium of creative ideas and some implications of what these emerging practices mean for teacher educators, principals, and teachers.

A Secondary School Curricular Investigation on Child Growth and Development, CHARLENE D. PALMER, *University of Missouri.*

This study was conducted in an attempt to determine some objective basis for developing a course in child growth and development for secondary school pupils. The major sources of data were: (1) the questionnaire prepared and mailed by the writer to a jury of outstanding people in child development, (2) seven books on child development approved by the jury, and (3) articles pertaining to child development appearing in the 1953 issues of ten popular home periodicals.

According to the analysis of the seven "approved" books in child growth and development, there is agreement upon sixteen over-all principles of child development. Two of the over-all principles of child growth and development refer to what is commonly known as "ages and stages." Four additional principles apply to the selection of infants' and children's clothing regardless of style. Also there are nutritional principles which are applicable to the pregnant woman and child from infancy through five years.

Based upon the research reported in this dissertation, the writer suggests that the following be included in a course in child growth and development for secondary school pupils:

1. The over-all principles of child growth and development plus the principles that pertain to certain details of child development.
2. The nine "ages and stages" of growth upon which there is agreement among the seven "approved" books.
3. The topics that received the greatest amount of emphasis in the books and/or the magazines.

A Brief History of Some Early Canadian Developments in Home Economics, EDITH C. ROWLES, *Teachers College, Columbia University.*

At the time this study was made, there were 14 institutions in Canada offering programs leading to the home economics degree; this history deals with the beginnings of 6 of the 14. Prior to 1908, Toronto University, Macdonald Institute of Ontario Agricultural College at Guelph, Macdonald College of McGill University, Acadia University, Wolfville, Nova Scotia, and Mount Allison University, Sackville, New Brunswick, all had well-defined home economics offerings which eventually led to degree programs. These five institutions are included in the study because of their early developments; the sixth institution—the University of Saskatchewan—is included because it is the one the author knows best.

During the last decade of the nineteenth century, the Young Women's Christian Association and the National Council of Women of Canada took the initiative in developing home economics programs in Canada. This history records their contribution and the subsequent need for teachers and dietitians.

An attempt is made to record some of the past, to draw attention to the present, and to give some suggestions for the future. Three of the major suggestions are: (1) that educational leaders reassess home economics programs in the light of modern social change; (2) that home economics faculties frequently re-examine their own program to note whether they are meeting professional needs and the changing needs of families; and (3) that the profession and the universities attack the problems of: shortage of professional leadership, development of a comprehensive program of research, and contributions to professional literature.

Developing a Plan for Better Acceptance of Home Economics at Eastern Mennonite College, MARY EMMA SHOWALTER, *The Pennsylvania State University.*

Many young women are graduating from college who have gained little knowledge of, or experience with, the problems they will face as homemakers. This is especially true in Mennonite colleges because of the prevalent belief on the part of parents that college is neither the place nor the means of receiving such information. Instead, it is considered the duty of mothers to pass on this knowledge to their daughters.

This study was concerned with two problems: first, discovering effective ways of helping college women realize their need of preparation for homemaking; second, assisting these women in looking at home economics not as an "extra" to work into their programs if possible but as a vital necessity in helping them face and solve life's problems.

In order to develop a plan for better acceptance of home economics at the college under study the present program was evaluated. For this appraisal the following four groups were selected as the sample: the administrative committee and division heads of instruction, all college women, home economics majors, and home economics graduates. The investigator also made a study of effective methods and techniques used by other institutions in the recruitment of students and the promotion of the program.

Findings from the study resulted in some of the following recommendations:

1. Take more specific steps to acquaint students and parents with the program.
2. Enlarge the present offerings to include a major in home economics education.
3. Consider making one course in home economics a part of the general education requirement of all women students. (Ninety-two per cent of the students were in favor of such a plan.)
4. Allow time for promotion and student guidance when planning teacher work load.
5. Work more closely with other departments of the college.

An Evaluation of College Home Economics Curriculums in Selected Colleges in the Southern Region of the United States, SHELBY MITCHAM STEPHENS, *Cornell University.*

The purpose of this study was to determine whether or not college home economics programs are meeting the curriculum needs of students in personal, home and family, and community living and in vocations and professions in home economics and related areas.

Sixteen divisions of home economics in the Southern Region of the United States and 293 graduates therefrom were included in this study.

Research findings indicated that the general education programs were not meeting the needs of the students. Administrators indicated: (1) that courses in the biological sciences and chemistry in physical science were not functional enough, (2) that students were not getting enough courses in general education, (3) that the requirements were too rigid, and (4) that there was not enough inter-disciplinary planning. The graduates rated general education courses low as to helpfulness to them since leaving college.

Findings also indicated some weaknesses in basic home economics programs. Administrators considered programs rigid, courses not functional enough, and that there should be some shifting of courses. Graduates rated basic home economics courses high as to their helpfulness since leaving college. They rated courses which give tangible evidences of success highest and courses which give intangible contributions to education lowest.

The 102 graduates who took positions in their major fields were as a whole satisfied with their vocational and professional education; 68 took positions not in their major areas.

Conclusions based on the study are:

1. Home economics students need to be helped to become aware of the contributions to education of courses which do not appear to give tangible evidences of success both in general education and in home economics.
2. Faculty members and students need to become aware that all education does not need to be functional to contribute to a full and satisfactory life.
3. Consideration should be given to positions available to students after graduation in education for vocations and professions.
4. There is need for strengthening education in extra-curricular activities.
5. There is need for strengthening education for personal, home and family, and community living and for vocations and professions.
6. Consideration should be given to a five-year period for education in home economics.

Improving the Program in Home and Family Living at Chico State College, GWENDOLYN DAVIS WAGNER [CARLSON], *Teachers College, Columbia University.*

The purpose of this project was to work toward the improvement of the program in home and family living at Chico State College in California and to record and analyze the processes used in improving the program. Four areas of the program were studied: the preparation of individuals for wage-earning, the development of interdivisional services, the contribution of the department of home and family living to the community, and the availability of opportunities in the community as resources for the enrichment of the program.

The study was carried on co-operatively under the direction of a committee selected from the entire faculty and appointed by the president of the College. Approximately one hundred persons were involved in studying the program at the College including national and state home economists in various careers, college personnel, students, homemakers, principals of high schools, and alumnae.

Recommendations as a follow-up of this study included: (1) evaluating the total program as well as specific courses in terms of changes in behavior; (2) interpreting the program to various individuals and groups within the region and, in turn, interpretation of their needs, by them, to the college; (3) experimenting with various types of courses for personal and family living; (4) working with other divisions and departments to interpret the needs of students and to improve and expand interdivisional and interdepartmental services; (5) planning a new building and facilities to allow for flexibility in the program; (6) increasing work with state agencies and the public schools; (7) establishing and maintaining adequate channels of communication; and (8) providing opportunity for personal growth of staff members.

Home Economics Teachers' Distribution of Time, RITA LOUISE YOUMANS, *University of Illinois.*

The major hypothesis tested in this study was: The distribution of time among professional and personal activities by home economics teachers in vocational departments is influenced by certain conditions inherent in the situation and by the teachers' attitudes toward these conditions. Specifically, these conditions were teaching load, years of teaching experience, attitude toward teaching position, and personal or family demands. All attempts to equate effectiveness of teaching with amount of time spent or to evaluate distribution of time were purposely omitted from this study.

The sample for this exploratory study included 126 teachers of vocational home economics from 11 states in the central region selected by the state supervisors as being representative of vocational homemaking teachers in the state.

The statistical findings are largely negative. The size of the teaching load, the enrollment in the high school, the years of teaching experience, and the teachers' attitudes toward their teaching assignments were not found to be related to the amount of time spent on the profession, with two possible exceptions: (1) the teachers in schools with 300 to 499 students enrolled seemed to spend more time on their profession than did teachers in smaller or larger schools, and (2) first-year teachers appeared to have spent more time on planning and studying for teaching than had experienced teachers. Teachers who were the mothers of preschool-age children spent significantly less time on their profession than did the teachers who were homemakers with children older than elementary age; but, otherwise, home and family responsibilities did not appear to make a significant difference in the distribution of time. Evidence of a strong value pattern for the professional *or* for personal-social-family satisfactions seemed to be reflected in the way time was distributed among professional and personal activities.

The teachers' estimates of the time spent on their profession were not significantly different from the time actually spent. The mean time estimated on a structured schedule was 49.2. On the basis of this finding, greater confidence may be placed on time studies derived from estimates in time distribution studies than was formerly given.

The mean time the 126 vocational home economics teachers spent on their profession in one week was 48.2 hours—an average of 21.75 hours on class instruction, 10.96 hours on non-class instruction, and 15.50 hours on non-instruction.

Family Economics—Home Management

Decision-making in Relation to the Performance of Household Activities in New York State Homes, MILDRED JEAN DAVIS, *Cornell University.*

This study was a preliminary examination of procedures families use in making day-to-day decisions, factors most influential in decision-making, relative importance placed on resources, number of alternatives considered, and satisfaction with decisions.

Fifty-nine homemakers in 1956 kept diaries in which they recorded details about household activity decisions made in a week. A follow-up interview was held with the homemaker and her husband.

Data were reported on 410 household decisions. The highest numbers were in the areas of care of the house, food preparation, and washing clothes.

Time was the key factor in decisions about shopping, dishwashing, washing, ironing, gardening, and care of the yard. Provision of material goods and services was the prominent factor in decisions concerning food preparation, food preservation, sewing, and community activities. Individual standards were the conspicuous factor in care of the house and upkeep of the house. The money factor was the most important in decisions about buying, and the people concerned were the most important factor in leisure-activity decisions.

Homemakers saw more than two alternatives in 11 per cent of the decisions. However, it would not be feasible for the homemaker to consider several alternatives to decisions of this magnitude.

Approximately four-fifths of all decisions reported were evaluated as being completely satisfactory.

During the interview, homemakers and husbands were asked to describe themselves as decision-makers. From their descriptions, persons were classified as either decisive, deliberate, or indecisive, according to their degree of facility in decision-making. Facility was related to satisfaction with decisions, finality of decisions, avoidance of decision-making, self-rating of the decision-maker, and formal education.

Some Bases for Recommendations for Storage Space Allowances in the Meal Preparation and Meal Service Area of Southern Rural Homes, LORNA JEAN GASSETT, *Purdue University.*[1]

The purpose of this study was to investigate: (a) the effect of differences in socioeconomic level, size of family, and age of homemaker on the kind of possessions used in meal preparation and meal service by southern rural families; (b) the effect of those factors on the number, type, and/or size of the possessions; and (c) the effect of the quantity and size or shape of articles to be stored, the frequency of their use, and the measurements of the worker's body on the vertical and horizontal limits of functional storage units.

The families were classified into two socioeconomic groups and subsorted on the basis of size of family and age of homemaker. Lists of utensils, "everyday" dishes, and "guest" dishes were compiled. Utensils and dishes considered representative were measured,

[1] Thesis was completed in 1955 but not available on interlibrary loan until other aspects of the over-all project were completed.

and an estimate of the space needed to store the utensils reported was computed.

Measurements of 74 women of eastern Tennessee were on file. The vertical area of space "within reach" of the 74 women was determined.

Socioeconomic differences were more marked with respect to "guest" dishes than with respect to "everyday" dishes and utensils. More families in the high socioeconomic group reported having the items studied and reported more kinds and greater quantities of the items. Homemakers over 40 years of age reported more kinds and greater quantities of dishes.

The number of items for individuals and the size of serving dishes and utensils were related to size of family. Consistent differences in the estimated storage space needed by the different size families, particularly in the low socioeconomic group, were apparent.

The measurements of the Tennessee women were similar to physical measurements of women reported in other studies. Storage, based on those measurements, built for the laboratory was used with ease.

Factors Affecting Farm Family Goals, EMMA GRACE HOLMES, *Purdue University.*[2]

The setting of goals is an important step in the process of management. Goals held by farm families are of interest to workers in programs providing these families with assistance in management problems. The purposes of this study were to learn the extent to which families recognize and can express their goals; to examine the relationship of such factors as stage of the family cycle, income, and tenure to the nature of family goals; and to develop methods by which these relationships may be analyzed.

Tipton County, an outstanding agricultural county of Indiana, was the locale of the study. Data were obtained by personal interview from 70 farm families in the spring of 1955. To be eligible for interview, a family had to (1) operate a farm on a full-time basis, obtaining the major part of its income from farming; (2) be headed by a man not over 50 years old; and (3) have one or more children.

Goals for education of children were generally (1) to have them graduate from high school, and (2) to help them obtain further education if they chose to go on. Farm ownership was a goal of all tenant families, though only half of them reported progress toward the goal. Two-fifths of all families expressed a goal of increased acreage for farming. Most families had goals for saving. Purposes for saving varied among stages of the family cycle. For most preschool families, increasing participation in community activities was a goal; in other stages of the cycle the goal was more frequently to continue the present level of activity.

A five-point scale was developed for scoring goals expressed by the families to facilitate description of groups of related goals and comparisons among groups of families. For a group of related goals, the higher the score the more definite the expression of, or action toward, the goals or the larger the number of achieved goals.

The families thought more clearly in terms of the relatively short-time goals than of the long-time goals. Thirty-three families mentioned a time five or more years hence when they expected to attain a goal they were working toward. Time of attainment of long-time goals was frequently described in terms of age of the children in the family.

The families differed considerably in their ability or willingness to express their goals. In general, goals of the 70 families had many similarities as might be expected in a group of families who have many characteristics in common and who are in close contact with each other.

Effects of Multiple Water and Drainage Facilities on Work Involved in Family Meal Preparation and Cleanup, ROSE ELIZABETH STEIDL, *Cornell University.*

The possibility of reducing work involved in family meal preparation and cleanup by having supplementary sinks at the range, mix, and refrigerator centers was determined from objective and subjective data in a laboratory study.

Practicality of number and location of supplementary sinks was learned by comparison of work in a one-sink kitchen to work in the same layout with the addition of one, two, or three supplementary sinks. Only minimum facilities of cold water and drainage were duplicated.

One co-operator repeated the work for one dinner menu in each of eight test arrangements. Memomotion movies and written records were made. The co-operator evaluated and compared test conditions through rating scales, rankings, and comments. Raters judged the use of the surface area at each center from photographs.

The co-operator rated all kitchens with a supplementary sink easier to work in than those without a supplementary sink. She ranked trial conditions with three supplementary sinks as liked best. She liked the source of water at the range center for preparation but during dishwashing disliked leaving the sink center to get soaking utensils.

Changes in work through use of multiple water and drainage facilities were more often to shift work from one part of the total job to another or from one place to another or to change the length of time for a center-use rather than to greatly reduce work. Work differences in layouts with a range supplementary sink compared to no supplementary sink were small, but consistently less work was done according to the measurements used. Some reductions occurred with a mix supplementary sink but none with a refrigerator sink.

[2] This is a report of a portion of Indiana's contribution to Project A.E.S. NC-32, Factors Affecting Financial Security of Rural Families.

A Study of Factors Affecting Financial Security in a Group of Indiana Farm Families, ALICE CAMILLA STUBBS, *Purdue University.*[3]

This is a study of factors affecting farm family financial security. The data were gathered from a random sample of farm families in eight central Indiana counties. To be considered part of the study, families had to consist of husband and wife and could include any other members dependent on the family income.

The purposes of the study were to obtain information regarding: (1) the extent of farm family financial security, (2) factors characterizing families evidencing financial security, and (3) ways of predicting farm family financial security.

Information obtained dealt with several phases of family financial management as well as characteristics of the family, the farm, the home, and the family's attitudes toward selected financial situations.

Three factors have been found that may indicate family financial security when it is postulated as a dichotomous situation while recognizing at all times that, in a sense, security may have many levels:

1. Ways of meeting emergency expenses
2. Ability to meet consumption cost
3. Net worth

Three other factors are strongly indicated as indicators of family financial security, and the results suggest the desirability of further study to establish their relationship. These are:

1. Amount of present indebtedness
2. Income
3. Type of provision made for old age

Other factors studied indicate important relationships to financial management, but the relationship to financial security depends on their influence on the other variables which have a more direct effect.

Family Financial Experiences of Selected Graduates of Morgan State College and the Implications of These Experiences for Teaching Family Finance, THELMA VIVIAN WINDER, *New York University.*

The purpose of this investigation was to identify the family financial experiences of selected graduates of one class of Morgan State College one year after graduation and to show the implications of these experiences for teaching a course in family finance at Morgan State College.

A questionnaire was constructed, and an interview was structured and administered for securing the necessary data. Certain criteria for determining the subjects were used, and a general description of those meeting the criteria was obtained.

No general pattern of expenditures was found to be prevalent among the families, but it was found that all families under study used the highest percentage of their incomes for advancement (personal care, medical care, reading, vacation, and transportation). They used the lowest percentage for housing.

Eight of the families were chosen for topical summary write-ups. These summaries included their family financial experiences and might be used in professional courses when teachers wish their illustrations to be realistic.

On the basis of the findings of this study, implications were drawn which indicated an encouraging attitude toward the use and management of money, suggestions for a course in family finance, topics for further research, and implications for marriage and family life. Recommendations for teaching a course in family finance at Morgan State College were made.

[3] This is a report of a portion of Indiana's contribution to Project A.E.S. NC-32, Factors Affecting Financial Security of Rural Families.

Family Relations and Child Development

A Study of Family Life Patterns as Expressed in Practices of Members in the Three Movements of Judaism, STELLA R. GOLDBERG, *Teachers College, Columbia University.*

The object of this study was to investigate the influence that affiliation in each of the three movements of Judaism (Orthodox, Conservative, Reform) has upon the attitudes and family patterns of its members.

Understanding traditions and cultural backgrounds of all families is of concern to educators in a democracy.

Areas of family life selected for investigation included: mate selection, pre-marital counseling, planning for children, education of children, married women working outside the home, divorce, observance of religious ritual.

This study is based on interviews with ten couples in each of the three movements. The couples were in "good standing" in their synagogues and met these criteria: age of husband and wife not to exceed 45 years; maximum age of children, 15 years; middle income group; born in the United States; high school graduates.

Practices accepted by all three movements were: divorce as a solution to inharmonious marriage; planned parenthood; home-school co-operation in planning family life education that includes sex education; premarital counseling; college education for boys and girls.

Major differences in attitudes existed concerning: mixed-religions marriage; married women working outside the home; making of decisions by children.

Families of the three movements attended synagogue and observed religious ritual, but the frequency of attendance and the degree of observance increased with the orthodoxy of the movement.

Findings of the study reveal that the more liberal the movement of Judaism, the greater the adaptation of family patterns to community practices.

Food and Nutrition

Performance of a Taste Panel in Judging Samples of Known Concentration, GRACE BENNETT, *Purdue University.*

Problems in use of a scoring system by an analytical taste panel were investigated. Chicken broth samples were diluted with distilled water to provide seven known concentrations at levels judges could identify without error. In each of four experiments, groups of either all seven or of four selected broth concentrations were compared with a standard sample which had a known score representing the highest or lowest concentration present in the group. A second group was scored in comparison to a known standard in the mid-range of concentration. A third group was scored without a standard. After the first three experiments were concluded, the judges were informed of the purpose of the study and during a fourth experiment were allowed to see their own scores and those of other judges.

A statistical analysis of the data indicated that known standard samples did not aid in preventing the spread of scores which occurs when the entire scoring range is not needed to describe the samples. Judges scoring groups of samples which contained one sample much different in concentration from the majority of the group tended to alter the scores of the samples closest to the gap in concentration.

When judges were allowed to see their own and other judges' scores, the amount of variation from judge to judge was decreased. The mean scores for levels of broth concentration were not changed significantly, and the mean square for replications was about the same as in a comparable experiment where the scores were not seen. The possibility of correlation of errors exists when judges see their own or other judges' scores.

Effects of Vitamin B_6 Deficiency in the Albino Rat as Related to Toxemia of Pregnancy, MYRTLE L. BROWN, *The Pennsylvania State University.* [Miss Brown held the AHEA Ellen H. Richards Fellowship for 1955-56.]

The effect of vitamin B_6 deficiency on the course of pregnancy in the maternal rat was investigated. The responses studied were those which might be related to toxemia of pregnancy. Nonpregnant animals were studied also in an effort to separate the effects of vitamin B_6 deficiency from those due to pregnancy alone. The following measurements were made on the animals: systolic blood pressure, specific gravity, thiocyanate space, blood volume, hematocrit, hemoglobin, total protein of serum, and serum protein fractions.

Reproductive performance was affected adversely by vitamin B_6 deficiency as evidenced by lower maternal weight gains, smaller and lighter litters, and a higher incidence of resorptions than was observed among animals receiving pyridoxine. Poor reproductive performance in the vitamin-deficient animals was attributed solely to the vitmain B_6 deficiency, since animals restricted to a similar level of food intake but with pyridoxine supplementation were able to reproduce satisfactorily.

Hypertension, edema, and hypoproteinemia were not observed in the vitamin-B_6-deficient animals under the conditions of this study. Vitamin-B_6-deficient animals did show a tendency toward water retention, lowered hematocrit levels, lowered hemoglobin concentration, diminishing total blood volumes, and poor reproductive performance as compared with pyridoxine-fed animals. Whereas a syndrome comparable to toxemia of human pregnancy was not produced, the results of this study indicate that vitamin B_6 is essential for normal reproduction in the rat and that in the deficient state the condition of both the mother and the fetus is seriously impaired.

Textiles and Clothing

Style in Dresses, KARLYNE ANSPACH, *University of Chicago.*

This study was concerned with three related problems:

1. Identifying differences in dress styles preferred among women grouped by various characteristics
2. Ascertaining the extent and nature of choice stability of women for specific design features in dresses
3. Comparing market offerings to consumers' preferences

These problems were approached by examination of dresses possessed by consumers. These were checked as to design items. Two factors—"age" and "size"—proved significant in setting patterns of dress choice among the women, and, of these, age seemed more important.

Choice stability for each design item was assumed to occur when one woman chose the same design features in two "well-liked" dresses in separate years. The choice stability for women in general varied among the design items.

Choice stability increased with age. This was particularly noticeable in items of the silhouette. This increased choice stability among older women suggests that they may resist more strongly than other groups fashion influence affecting silhouette.

Choice became more stable in large sizes after the age of 45. The increase in choice stability for this group came in those items which are often emphasized by stylists as affecting "apparent" size.

The offerings in the catalogs appear to cater least to the choices of women of large sizes. In addition, the change in offerings from year to year in the catalogs was most unstable for this group of women whose preferences appear most stable.

A view of the consumer market as a series of "age-size" groups of women with design preferences of their own seems a helpful approach to the study of consumers' wants in dresses.

Development and Analysis of Dye Formulations to Match the Seasonal Colors of the Color Association of the United States, Incorporated, VERNA ADAMS GARRARD, *Texas Woman's University.*

The study covered by this dissertation was concerned with obtaining the most nearly colorfast dyes possible to match the seasonal colors selected by the Color Association of the United States, Incorporated, for promotion in garments and other fashion goods during the Spring-Summer season of 1957, and to evaluate the dye formulations found to match these seasonal colors by testing them for colorfastness. Such factors as laundering, dry-cleaning, pressing, crocking, and exposure to light and perspiration were tested in the trials of these dyes. Two major dye types were used in the dye formulas—direct dyes and vat dyes.

Viscose rayon samples were dyed both with direct and vat dye formulas to match the 40 colors in the 1957 Spring-Summer color cards. The direct dyed fabrics exhibited the poorer results in the colorfastness tests. The greatest degree of discoloration with respect to a composite test cloth containing many types of fibers designed to show staining of a dyed fabric onto another fabric occurred in the acid perspiration test and in the laundering test at 160°F. As a class, the vat dyed fabrics exhibited the better performance in the colorfastness tests. The vat dyes were more colorfast than were the direct dyes used in matching the color card.

The Criteria Used by Homemakers Purchasing Low-priced, Cotton House Dresses in Two Lafayette, Indiana, Stores, CORADEL HAMILTON, *Purdue University.*

This is a study of the criteria used by purchasers in selecting low-priced, cotton house dresses in two Lafayette (Indiana) stores, the extent to which these dresses met specifications included in the standard for housework dresses formulated by the American Home Economics Association,[1] and how they performed.

The purposes of the study were to obtain information regarding: (1) what such terms as quality, good value, durability, serviceability, and becomingness mean to house dress purchasers and what characteristics of material, workmanship, design, and fit they believe indicate these qualities; (2) how purchasers recognize the qualities they seek; (3) the extent to which the criteria used in selecting house dresses varies among purchasers and the factors responsible for the variation; (4) the extent to which preferences reported in "The Consumer Speaks—About House Dresses," a study sponsored by the American Home Economics Association,[2] were used by these purchasers; and (5) purchasers' satisfaction with house dresses purchased.

The investigation of purchasers' buying habits revealed that to obtain the qualities they desired, purchasers depended on previous experiences. If they had had no previous experiences with the store or brand name, they tried on the garment, inspected its workmanship, and asked salespersons questions about it. More purchasers were satisfied with garment features than were satisfied with fit.

The comparison of house dresses with specifications included in the standard for housework dresses and the subjection of the same garments to a year's wear test revealed no consistent relationships between garment performance in use and specifications met. However, the garments did vary significantly in their ability to withstand wear.

Factors Related to Children's Clothing Preferences, LUCILLE AUST HUNT, *Purdue University.*

The purpose of this investigation was to determine what relationships exist among certain factors generally assumed to influence children's clothing preferences. The stimulus variables were color (including hue, brightness, and saturation), pattern, style (in relation to occasion), and texture.

One hundred twenty-eight children, ranging in age from three through ten and living in an upper-middle-class suburban area, were interviewed. Each child was asked to indicate his preferences among each group of stimulus variables and to describe his best liked and his least liked clothes.

The results of this investigation suggest that, under these conditions, certain tendencies exist among the factors related to these children's clothing preferences. These tendencies may be summarized as follows:

1. Significant differences in preferences appeared to exist among each of the six stimulus variables.
2. Brightness and saturation preferences tended to vary significantly with color.
3. Pattern preferences tended to vary significantly with color preferences.
4. Style preferences tended to vary significantly with occasion.
5. Age appeared to influence color, pattern, style, and texture preferences but not brightness or saturation preferences.
6. Sex appeared to influence brightness, pattern, and style preferences but not color, saturation, or texture preferences.
7. Mother-child agreement appeared to increase with advancing age, although the magnitude of the differences was significant only in the cases of style preferences and texture preferences.
8. Sex appeared to influence mother-child agreement on brightness and style preferences but not on color, saturation, pattern, or texture preferences.

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[1] See Tentative Consumer Standard C.H.–I, Housework Dresses: Cotton, 1950 (Mimeographed).

[2] ALICE SUNDQUIST and MARY C. WHITLOCK, The Consumer Speaks—About House Dresses, J. HOME ECON. **37** (Nov. 1946), pp. 562-568.

The Child in the Educative Process. By DANIEL A. PRESCOTT. New York: McGraw-Hill Book Company, Inc., 1957, 502 pp., $6.50.

Dr. Prescott, a well-known authority in child development, presents, against a background analysis of the educative process, a complete description of a three-year child study program which he and his staff at the Institute for Child Study, University of Maryland, have developed during a 16-year period of continued experimentation with 40,000 teachers in 15 states. The book carries a wealth of material to help adults understand children. It has direct application for teachers in elementary and secondary schools, but it has great value for anyone interested in children's development.

The contents are divided into four parts. In Part I, Dr. Prescott presents his deeply felt philosophy of education, a group of basic assumptions which underlie the educative process and the implied functions of the teacher.

Part II presents the scientific principles that explain how children grow and learn, how they become the persons they are, and why they behave as they do. In careful detail the reader is taken through the steps of how one interprets behavior, obtains and organizes information, sees development, and analyzes group dynamics.

Part III emphasizes the need for studying the uniqueness of individuals and explains the factors which "interact to give rise to the motivation and feelings and gradually shape the developing self."

In Part IV, Dr. Prescott reports some of the changes in education which he sees taking place and which he thinks must come about in all schools if teachers are genuinely to understand their pupils as individuals and to help each child develop his full potential.

The book includes a ten-page bibliography in which the references are conveniently keyed to correspond to the six areas used in the framework of organizing information.

The presentation is lengthy but never tedious. Scientific concepts are generously supplemented with information on specific children so that meanings are clear cut and explicit. It is a technical subject but presented in clear and informal style. The book is unique in that it describes a unique program.

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THE TEACHER EXCHANGE FOR HIGH SCHOOL FAMILY LIFE EDUCATORS, a new eight page feature of the Journal, began with the February 1958 issue. The EXCHANGE is being developed in cooperation with the American Social Hygiene Association to provide family living teachers with new resource materials. The EXCHANGE Editor is Christine Beasley, Home Economics Department, University of Tennessee. Contributing editors are Elizabeth Force, American Social Hygiene Association; Judson Landis, University of California; Charles Martin, Minnesota Family Life Extension Specialist; Rex Todd Withers, Michigan State Education Department. Ask for your subscription to begin with the February issue and miss no copies of the new EXCHANGE.

Plan also to attend the 20th annual NCFR meeting in Eugene, Oregon, August 20-23, 1958.

warranted by the heartening results seen among teachers and children who have participated in the child study program. The reader feels he'd like to be a part of such an exciting experience in which the adult has as much to gain as the child. —BERNICE D. BORGMAN, *Michigan State University.*

Home Economics Careers for You. By VELMA PHILLIPS. New York: Harper & Brothers, Publishers, 1957, 278 pp., $3.75.

Dean Phillips' attractive new book is designed as a text for a beginning course in home economics for freshman students. It is the first in Harper's "home economics series and was under the editorship of Helen R. LeBaron."

The book begins with a friendly chapter on getting to know the college and developing understanding and appreciation of what can be achieved there. Once the young student is comfortably settled in college, Dean Phillips helps her to begin to explore the general outlines of her chosen field of home economics and to become sufficiently acquainted with the various careers in home economics to make a wise choice of the career which will best suit her ability and interest.

A chapter on home economics curriculum helps the student to understand course requirements and appreciate the contribution that various courses make to professional preparation for the future. The chapters on careers in home economics and the descriptions of what home economics graduates are doing today introduce the student to individuals who have been successfully carrying on home economics jobs in a wide variety of positions. Together with the material on the subject-matter of home economics, the chapters on professions well emphasize the scope of home economics.

A chapter on home economics in other countries and one on home economics in the future add to this picture of the breadth of the field, and—perhaps more important since the text is directed to freshman students—these chapters give a feeling of expansion and of many opportunities in the years ahead.

Excellent photographs throughout the book enhance the tone of friendliness and personal communication with the student.

To add to the usefulness of the volume as a text, the author has included questions for discussion with each chapter and an extensive bibliography for the subject as a whole.

The amount of information brought together on home economics will make this a valuable reference for all home economists.

ON THE JOB ...for you

NEWS NOTES

GENERAL

Irene E. McDermott, director of home economics education in the Pittsburgh public schools and AHEA's senior vice-president, was one of ten Pittsburgh "Women of the Year" selected by the *Pittsburgh Post-Gazette* and cited as a "Distinguished Daughter of Pennsylvania for 1957" for her "tireless work in community service." An officer or member of many service organizations, Miss McDermott is chairman of the program committee for AHEA's 1958 annual meeting in Philadelphia, June 24 to 27.

Jessie W. Harris, vice-dean of the College of Home Economics at the University of Tennessee, is the only woman on the Committee on Institutional Projects Abroad of the American Council on Education. The Committee met in Washington, D.C., on January 2 to consider future plans. The University of Tennessee has three contracts with the International Cooperation Administration, one of which concerns assisting with a home economics program in certain colleges in India.

The Hazel Kyrk Memorial Fund Committee reports that the fund is being kept open until March 10. Contributions will then be distributed to the libraries of the University of Chicago and Iowa State College. Contributions should be sent to the Committee's secretary-treasurer, Ruth Reticker, 3217 Aberfoyle Place, N.W., Washington 15, D.C.

STATE ACTIVITIES

DISTRICT OF COLUMBIA. R. L. Beukenkamp, chief of the U. S. Office of the Intergovernmental Committee for European Migration and former agricultural attaché for the Netherlands Embassy in Washington, discussed "Peoples on the Move" at the January 15 meeting of the **District of Columbia Home Economics Association** at the Washington Gas Light Company.

ILLINOIS. Home economics research at the **University of Illinois** includes the following:

Comfort-of-clothing research. Work on the effects of clothes on comfort, under the direction of Jane Werden, is a co-operative project with the Physical Environment Unit, under the direction of Maurice K. Fahenstock, a mechanical engineer. They are trying to find out whether there is a measurable difference in the comfort of clothing of different fiber content. Garments of cotton, nylon, acetate, and Arnel have been tested in two series.

Work now in progress involves use of one-piece suits of similar fabric construction but different fiber content (Orlon and cotton) to determine whether wearing the different fibers results in differences in amounts of liquid sweat remaining on the surface of the skin upon exposure to hot, humid conditions (94°F, 80 per cent r.h.).

Detergent research. Ruth Galbraith has begun work to determine the comparative efficiencies of two dozen soaps and synthetic detergents in soil removal and whiteness retention on cotton, wool, viscose, nylon, Orlon, and Dacron fabrics. Washing temperatures varying from 70° to 140°F and detergent concentrations of 0.1, 0.2, and 0.3 per cent will be studied. In addition, the effects of these detergents at various temperatures on wool shrinkage and appearance and on the elastic modulers of elastic fabrics will be studied. The effects of the cold water soaps and detergents are of particular interest in these last two studies.

Foods research. Research on fresh and frozen vegetables prepared in an electronic oven has been recently started under the direction of Frances O. Van Duyne. Times required to give tender "done" products are being determined. The palatability and ascorbic acid content of vegetables cooked in an electronic oven and of those prepared by conventional methods are being compared.

Nutrition research. A new project entitled "The Nutritional Status and Dietary Needs of Older People with Particular Emphasis on Energy Needs" is being planned by Janice M. Smith and Beula McKey.

Current guides for caloric needs, which were set up largely on the basis of studies conducted prior to 1920, need re-examination since activity of many individuals has declined due to current modes of transportation and increased mechanization in homes and at work. Dietary habits have been modified as a result of food technology and because of these lowered caloric needs. Current recommendations for adults were set up largely with young, vigorous adults, and little evidence is available as to possible changes in energy expenditure and efficiency of food utilization in aging. The objective is to investigate the utilization of food in relation to the caloric needs of adults, the maintenance or change of body weight, and nitrogen retention.

Starch research. Elizabeth Osman is conducting research on the correlation of the chemical and physical properties of starches with their behavior in food products. Current studies are determining the effect of other ingredients on the viscosity and gel strength of starch pastes. Among these ingredients under study are various sugars, including dextrose, fructose, and lactose, as well as sucrose, which has been studied previously.

Housing research. Research for a "Wheel-Chair Kitchen," using actual wheel-chair subjects, is in progress at the Illinois Experiment Station. Helen McCullough and Mary Farnham are measuring and testing women who are confined to wheel chairs. Both specially designed and conventional equipment are being used to determine suitable kinds of cabinets and appliances for the wheel-chair homemaker.

Research is also under way to determine what implications new equipment, such as wall ovens and wall refrigerators, has for storage and kitchen arrangement. Those participating with the Illinois Station are Avis Woolrich of the U. S. Department of Agriculture; Kathryn Philson, Alabama Polytechnic Institute; Mrs. Ruth Smith, Pennsylvania State University; and Anna Wood, Washington State College.

Elizabeth J. Lynahan, home service director of the Peoples Gas, Light & Coke Company, Chicago, and a member of the program-of-work committee of the AHEA, became Mrs.

Francis Xavier Mettenet on January 2, 1958.

IOWA. A new laboratory in Home Economics Hall at **Iowa State College** has been equipped especially for use in new research on *energy requirements of women and children*, a research study initiated at the College.

A grant has been received from the Public Health Service of the U. S. Department of Health, Education, and Welfare for a study of the *role of fat in protein metabolism* through feeding low-energy diets to depleted rats. Lotte Arnrich, associate professor of food and nutrition and home economics research, is the leader of the project.

At the **State University of Iowa** the departments of television and home economics are preparing a series of *kinescopes to teach textile design*. The series includes weaving, block printing, screen printing, and rug hooking and should be of value to groups working with these crafts.

A study of terry towels for consumer use is being carried on at the University by Merle Ramer and L. A. Bradley. A comparison is being made of towels in three price ranges, half of which meet the minimum performance requirement of the American Standards Association standard L24 2.5 and half of which do not. One purpose of the study is to provide subject matter and illustrative material to teach how informative labels and performance standards can aid the consumer in buying.

Cholesterol in blood and tissues of adult pantothenic-acid-deficient albino rats is being studied. Deficiency has been produced in from six to eight weeks using a diet lacking in pantothenic acid but with a metabolic antagonist, omega methyl pantothenic acid. In the first phase of the study, when mean weekly values for deficient animals were compared with control animals, no differences were found. Lower cholesterol levels were found in adrenal glands from deficient animals than from control animals, but significant changes were not noted in lung, liver, or spleen. Histological examination of adrenal glands from deficient animals revealed massive hemorrhagic necrosis of the adrenal cortex. The work is being extended to include blood lipoproteins of animals fed diets using various fats. The first phase of the study is in process of being published by the *Journal of Nutrition*.

F. Eugenia Whitehead is continuing *studies in nutrition education* with adolescents.

KANSAS. At the **University of Kansas** the textiles area has been expanded with a new conditioning room and additional equipment for textile testing.

Marilyn McNelis of Coffeyville, a graduate student in foods and nutrition at Kansas State College, received the 1957-58 $250 Cowbelle scholarship, an award given annually by the Cowbelles, an organization of wives of members of the Kansas Livestock Association, to promote research and greater use of meat. Miss McNelis plans a study of the tenderness of certain beef muscles at several stages during cooking.

MINNESOTA. Nutrition research at the **University of Minnesota** includes the following:

The energy intake of older women. Quantitative data on the energy intakes and losses of older women living on self-selected diets are being used to study the energy requirements of older population groups. Energy expenditure also is being investigated. The method of determining total heat production by insensible weight loss is being tested and the applicability of this method to older population groups living under representative conditions is being assessed. Workers on this project are: Helen L. Pilcher and Jane M. Leichsenring (leaders), Stephen Frommes, and Mrs. Carrie H. Sheehan.

Calcium utilization. In this co-operative project with the Ohio Agricultural Experiment Station the effects of various factors on the utilization of food calcium by college women are being investigated. The factors studied include the intake levels of phosphorus, protein, and ascorbic acid, the calcium-to-phosphorus ratio in the diet, and the amount of milk regularly consumed by the subjects before participating in the study. Project workers are: Jane M. Leichsenring (leader), Helen L. Pilcher, Loana M. Morris, and Mrs. Barbara A. North.

Nutritional status and dietary needs of older women. Minnesota is co-operating with the agricultural experiment stations in Illinois, Indiana, Iowa, Michigan, Missouri, Nebraska, Oklahoma, South Dakota, and Wisconsin and the Institute of Home Economics, U. S. Department of Agriculture, in a study of the nutrition of women 30 years of age and older. At present, nitrogen balance on self-selected diets and the interrelationship between energy and nitrogen metabolism are being investigated. Those making the study are Jane M. Leichsenring (leader), Loana M. Morris, and Stephen Frommes.

Food research. Research being conducted in the food research laboratories of the School of Home Economics is contributing to the existing knowledge of the nutritive value of cooked meats and vegetables and to the extent to which commonly used household methods of cooking affect the nutritive value of these foods. For example, the thiamine and riboflavin of pork, beef, lamb, and veal cuts and the ascorbic and dehydroascorbic acid contents of many vegetables, each cooked by methods commonly employed in American homes, have been determined and the methods compared as to their effectiveness in conserving these nutrients. Also, in co-operation with the household economics research division of the Institute of Home Economics, USDA, methods have been developed for collecting from homemakers information concerning the money and time costs involved in the preparation of typical baked products. Results of a pilot study conducted to test these methods were presented in the November 1957 issue of the JOURNAL.

Textiles and clothing research. The University has an on-going textiles and clothing research program in which both faculty and students participate. Suzanne Davison and three graduate research assistants, Mildred Ball, Lou Legried, and Viletta Leite, have been engaged in the co-operative Central Region clothing and textiles research program on the consumption, characteristics, and serviceability of children's garments. Physical measures of fabric quality are being made on two weights of cotton jeans worn by 9- and 10-year-old boys. Differences in fabric structure in laundry treatment as well as rate of deterioration due to wear are being determined. As part of the Agricultural Experiment Station program, blends and combinations of various fibers suitable for shirts and blouses are being evaluated for the effect of construction and fiber content on durability, comfort, and esthetic properties of the fabric.

Florence Ehrenkranz, who joined the staff of the University of Minnesota in 1957 and has been appointed a full-time member of the faculty of the

Graduate School of the University, is preparing topical outlines for advanced undergraduate and graduate courses in household equipment to be taught during the summer as well as during the regular school year.

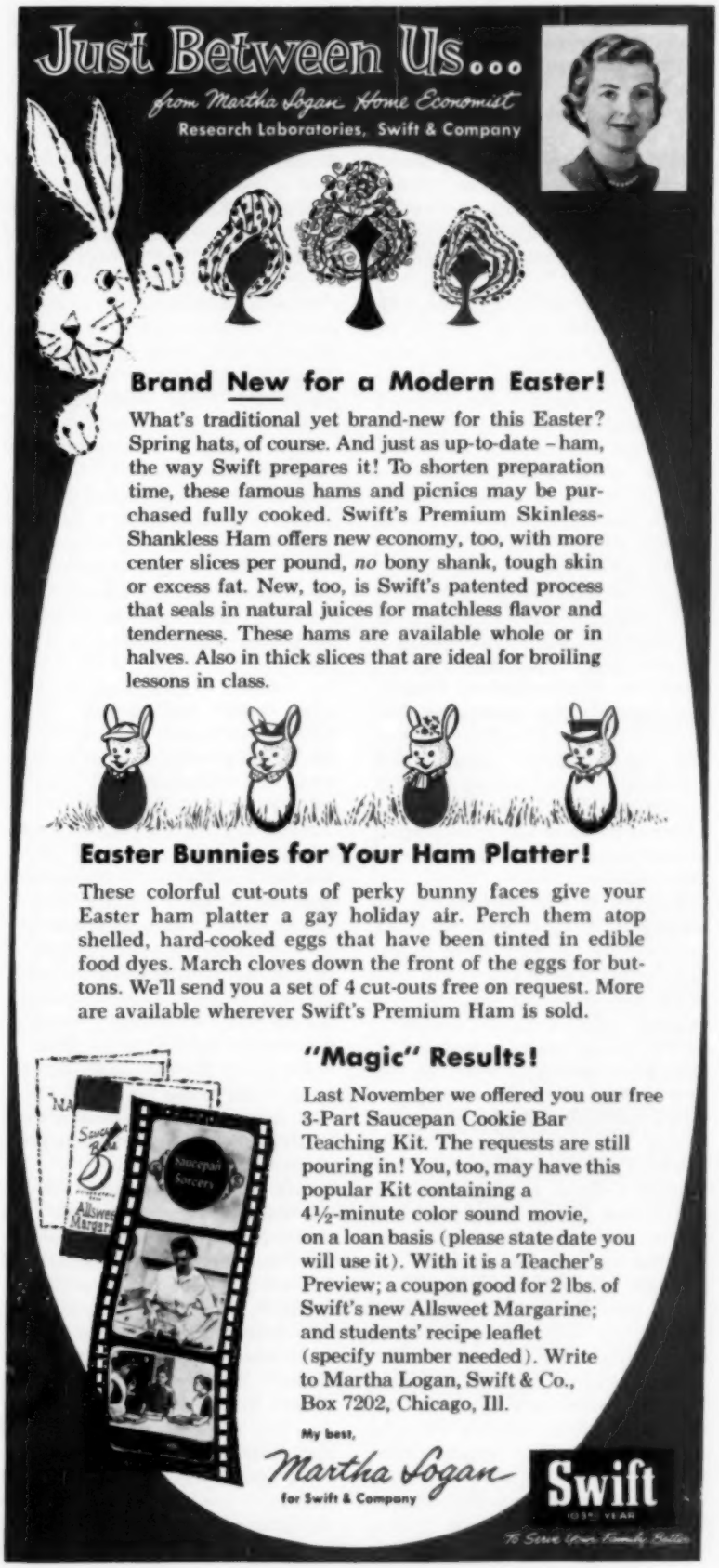
The death on December 16 of **Aura Keever,** supervisor of home economics education in Minnesota for many years, was a shock to those who knew her.

Mrs. Edna Jordahl of Moorhead, Clay County home agent since 1955, on December 10 was named winner of the annual information contest sponsored by the University of Minnesota Agricultural Extension Service. She also received the award in 1955 and is the only agent to have had it twice.

MISSISSIPPI. During 1957 the home economics department of the **Mississippi Agricultural Experiment Station** issued three new bulletins by Dorothy Dickins and Virginia Ferguson: (1) "Practices and Attitudes of Rural White Children and Parents Concerning Money, Lower Coastal Plains Area," Technical Bulletin No. 43, April 1957; (2) A nontechnical report of the same study—"Money Practices and Attitudes of Rural Children and Parents," Circular 209, July 1957; and (3) "Methods and Techniques for Study in Decision-making in Regard to Use of Dairy Products," Home Economics Series No. 1, May 1957. It is expected that by July reports will be available on two other studies: (1) "Change in Family Food Purchase and Use Practices Following Gainful Employment of the Wife," (2) "The Influence of Locker Plants and Home Freezers on the Consumption and Market Outlets for Locally-produced Farm Products."

Mississippi has participated in a **national study on home demonstration club membership.** Mississippi's part has been completed and is ready for use in the state. The findings of this study will be used as a basis for developing a home demonstration program to meet the needs of Mississippi homemakers.

NEVADA. The School of Home Economics of the **University of Nevada** recently completed a new approach to its curriculum offering. The curriculum proposal is the culmination of a two-year study which involved co-operative planning on the part of the staff with homemakers, professional home economists, and professional people in other departments and colleges on the University campus.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Scheduled speakers for the first **4-H Leaders Conference** in Nevada, to be held in March at the University of Nevada, include: Norman Mindrum, executive secretary of the National 4-H Foundation; Fern Shipley, regional supervisor for youth and young people's work, Federal Extension Service, Washington, D.C.; and Jordan Crouch, public relations director of the First National Bank of Nevada.

NEW JERSEY. Douglass College and the department of agricultural biochemistry of Rutgers University are co-operating in the second year of a four-year project **"Relationships between the Metabolism of Protein and Vitamin-B_6-Containing Enzymes."** Eight Douglass students were on an eight-week controlled diet containing a normal protein level but low on B_6. The biochemical determinations on blood and urine samples are now being done by the biochemistry department.

A study of the **food habits of teen-agers** in New Jersey is being sponsored by the New Jersey Nutrition Council. Last year northern New Jersey was surveyed; this year the southern half of the state. The committee working on it is composed of Mrs. Janet Schock, director of the New Jersey school lunch program; Mrs. Irene Wolgamot, New Jersey Extension Service nutrition specialist; Estelle Carlson of Glassboro State Teachers College; and Edna Sostman of Douglass College. The results of the two surveys will be compiled and analyzed by the home economics department of Douglass College.

The New Jersey Department of Health has developed a course, to be taught at Rutgers University, for training members of the New Jersey Homemakers Service to aid chronically ill patients. New Jersey is the only state that has such a program under the auspices of the state university and the homemakers service. Assisting in developing the course content on nutrition and home care were Mrs. Margaret Zealand, state consultant in public health nutrition; Mrs. Carolyn Addison, nutrition director of the Newark Chapter of the Red Cross; Bernice Garrigus of the Public Service Electric and Gas Company; and Gertrude Lotwin of the State Department of Institutional Agencies.

Adelaide Rawson, assistant professor of home economics at Douglass College, retired last spring. She is living in Ridgewood.

Nanette Robertson has been appointed hospital dietary consultant with the New Jersey Hospital Association, a new position created with grant-in-aid funds from the New Jersey Department of Health.

NEW YORK. "Getting to Know You" was the theme of a workshop recently held by the *Central Western District* of the **New York Home Economics Association.** In co-operation with the home service department of the Rochester Gas and Electric Company, "What's New in Foodland Equipment" was presented in a program which included the latest laundry research, kitchen planning, electronic oven demonstration, home lighting, and home furnishings. Three meals served featured ideas for new foods and different types of food preparation.

Home Economics Unlimited, Home Economists in Homemaking of the *Southeastern District* of the Association, had as guest speaker recently Martha Kelly of General Foods, who gave a behind-the-scenes picture of activities in the company's test kitchens and outlined career opportunities for home economists considering returning to the field of business.

The group also met jointly with the Long Island Home Economics Council to hear a panel discussion on ideas to interest college-age women in home economics.

Ada V. Felch, formerly of the University of Texas, is the new head of the division of home economics at the State University Agricultural and Technical Institute at Cobleskill.

OHIO. Some 35 home economists have formed the *Columbiana County home economics group* of the **Ohio Home Economics Association.** Charles Truxal, executive secretary of the Dry Cleaners Association, and Mrs. Frank Huffman, who teaches flower gardening, have been recent speakers at meetings of the group. The president is Mrs. Stanley Correll, foods, nutrition, and home management instructor at the Salem School of Practical Nursing.

The Cleveland Dietetic Association met with the *Cleveland home economics group* for a dinner meeting at Cleveland City Hospital at which time Nobel Prize Winner Frederick Robbins, MD, head of the department of pediatrics at City Hospital, covered high lights of the polio and Asian flu immunization programs.

In keeping with the current interest in **brainstorming** as a method of solving problems, the Cleveland Dietetic Association and the northeastern section of the Ohio Dietetic Association held a workshop at which William Uraneck, supervisor of salaried personnel of the Ford Motor Company's Cleveland plant, led the program entitled "Let's Learn Brainstorming."

A conference was held at **Ohio State University** to explore the possibilities of supplementing and expanding professional course offerings in state universities and colleges for lunchroom supervisors and managers on a credit or non-credit basis to help meet the steadily increasing need for professionally trained supervisors for this professional work. The staff of the School Lunch Program of the State Department of Education met with representatives from state universities and the Ohio School Food Service Association.

Lelia Massey, chairman of the department of home economics at Ohio Wesleyan University, has faculty fellowship leave this semester to do research at the School of Economics and Political Science of the University of London. She expects to study comparative cultural patterns of family life and the effects of social change on the value systems of families in different countries.

Jane Cape, professor emeritus of Antioch College, has returned to Yellow Springs after resigning as head of the home economics department at Queen Aliyah College in Baghdad, where she went as a Fulbright lecturer in 1952 and returned to the College in 1954 for three more years at the request of the Iraqi government. She had the satisfaction of seeing the first two 4-year classes in home economics at the College graduate.

OREGON. The 36th annual meeting of the **Oregon Home Economics Association** will be held on April 25 and 26 at Oregon State College. Gen-

eral convention chairman is Hallene Price, Oregon State College extension home management specialist. Phyllis Grant of the College clothing department is program chairman.

Oregon home economists are participating on **"Especially for Women"** and **"Extension 7,"** two programs recently initiated on Station KOAC-TV, the new educational television station of the State Board of Higher Education. The station's studios are at Oregon State College and the University of Oregon.

Dean Miriam Scholl of Oregon State College was elected to a one-year term on the executive committee of the American Association of Land-Grant Colleges and State Universities, and **Frances Clinton,** state leader of the home economics extension program, was elected to the Association's senate. Dean Scholl has also been appointed to represent the Association on the Board of Trustees of the National 4-H Club Foundation.

Mrs. Mabel Mack, assistant director of the Oregon Extension Service, was awarded Epsilon Sigma Phi's Grand Council certificate of recognition for outstanding service.

Marilou Garner, Marilyn Nemecek, June Pehrson, Anne Bergholtz, Carol Armstrong, and **Mrs. Belva Covey** recently joined the Oregon extension staff as county home economics agents.

Evelyn A. Funk is new state extension agent.

Mrs. Winnifred Gillen, state 4-H club agent, became Mrs. Fulmer on November 29, 1957 at Berkeley, California.

PENNSYLVANIA. The 25th annual meeting of the **Pennsylvania Dietetic Association** will be held at Pennsylvania State University on April 24 and 25. "Projecting Ahead 25 Years" will be the theme.

Madaleine Hall of Philadelphia has been named director of home economics of Knouse Foods, Peach Glenn fruit processing company. She will be allied with the firm's research division in the creation of new products for mass feeding and will direct recipe development.

TENNESSEE. Foods typical of 22 countries, a résumé of food habits and customs of 6 foreign countries, and 14 foreign students in native dress bringing foods they had prepared, set the stage for the **Foreign Foods Buffet** held by the Knoxville area home economists on November 11. This first meeting of the year carried out the theme chosen for 1957-58—"New Adventures in Foods, Clothing and Shelter."

Mrs. Ellen Monroe, Knoxville Utilities Board home economist, was hostess for this event to more than 50 guests in the Board's home service department. Lillian Keller, chairman of the hospitality committee, with the help of the home economists in business group added atmosphere by pinning a small flag of different countries on each guest as she registered, by planning a unique foods game for a mixer as the group assembled, and by arranging the beautiful table featuring fruits and the foods prepared from foreign recipes.

WISCONSIN. The School of Home Economics at the **University of Wisconsin** is one of the recipients of another grant from the General Foods Fund for two unrestricted $3,000 graduate fellowships for 1958-59. Candidates may be working for a doctor's or master's degree, but preference will be given to PhD candidates.

"Our Farms and Homes in a Changing Economy" was the theme for the Farm and Home Week held at the University of Wisconsin from February 3 to 7. Margaret Liston of Iowa State College was among the speakers on the general program. Helen Matheson of the *Wisconsin State Journal* and Eleanor Ahern of Procter and Gamble were among the speakers in the sectional meetings. Mrs. Vernon Thompsen, the wife of the Governor, gave a tea for the women attending the programs.

Dorothy Hussemann, chairman of the department of foods and nutrition at the University of Wisconsin, was married on December 21 to Frank Strong, professor of biochemistry at the University. Mrs. Strong expects to continue her professional work.

Agatha Norton and **Mrs. Ruth Davis,** related art instructors in the School of Home Economics at the University of Wisconsin, had pictures on display in the Wisconsin Salon at the University's Memorial Union. Miss Norton exhibited an oil painting, "Fisherman's Cove"; Mrs. Davis, two watercolors, "Lumberyard" and "Prairie Farm."

Two **Stout State College** students, Nancy Feuerstein and Anne Marie Dahl, have won statewide and area recognition and $250 and $300 college scholarships, respectively.

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FLASHES FROM OUR ADVERTISERS AND EXHIBITORS

A booklet for homemakers called **"McCall's Book of Fibers and Finishes"** contains basic, practical information about textiles—from acetate to wool. It gives thumb-nail descriptions of yarns and fabrics—their source, their form, their care and use, and explains how to launder these different materials, how to use them most practically in the home, and points out useful hints on their upkeep and wearability. The booklet can be obtained by sending 25 cents in coins to McCall's Modern Homemaker, P. O. Box 1390, Grand Central Station, New York 17, New York.

The Wooster Rubber Co. has just announced a corporate name change to **Rubbermaid, Inc.** James R. Caldwell, president and founder of the company, said that the brand name of the company had become such a valuable asset that a name change had been considered periodically in recent years. Mr. Caldwell coined the brand name, "Rubbermaid," to help highlight the function of the company's first product—a rubber dustpan—which was manufactured in 1934.

The Electrolux Corporation, 500 Fifth Avenue, New York 36, N. Y., has prepared a loose-leaf **Teaching Guide** which gives the homemaking teacher a variety of information about vacuum cleaners. Some of the topics covered are: basic considerations in selecting a vacuum cleaner, types of vacuum cleaners and their care, plus suggestions for the teaching-learning situation. Also included is a student circular which features highlights of the information contained in the Guide.

Since small tots go for the flavor of chicken in such a big way, **Swift & Company** has added three new chicken varieties to its line of strained meats for babies. Chicken a la King, Chicken with Sweet Potatoes, and Chicken with Rice are designed to add interest and variety to baby's meals without making additional work for a busy mother. The three new varieties are packed in the familiar 3½-ounce container which is so handy to use.

Jane Albrecht has been appointed director of O'Keefe & Merritt Company's new home economics department in Los Angeles. Miss Albrecht is a graduate of Pennsylvania State University and was formerly employed as home economist with Procter & Gamble and Kellogg Company.

The 1958 **Norge** refrigerator has, for the first time in an electric refrigerator, an ice-cube-making invention that makes, delivers, and stores cubes automatically. Norge calls its invention the "Handi-Cube." As many as 108 ice cubes are made available for immediate use, and when frozen the cubes automatically drop into a transparent ice bin where they remain dry and separated. Other features include swing-out shelves and a lever-controlled shelf spacer. Two "Swing'n Serve" trays and a crisper swing clear of the refrigerator interior at the touch of a finger, and both trays and crisper can be removed instantly for serving, use at the work area, or for easy cleaning.

Mint-o-mag (mint flavored milk of magnesia) has been introduced by E. R. Squibb & Sons. Mint-o-mag is described as being creamy smooth and easy to take, possessing a refreshingly different flavor with a particular appeal to children as well as to adults.

Do you know how the **Hotpoint Company,** manufacturers of many electrical appliances, got its name? In 1903 Earl H. Richardson, founder of the company which eventually became known as Hotpoint, designed a new electric iron which was an improvement over previous heavy, cumbersome models. Although Richardson's iron was of better quality, it had one major fault—the iron got too hot in the center of the ironing plate. At this time Mrs. Richardson suggested to her husband that he make an iron with more heat in the point, pointing out that women needed an iron with a hot point to press around buttonholes and in and around ruffles and pleats on family clothing, curtains, etc. From this idea was developed the iron with heating elements that converged at the tip. "The iron with a hot point" became a reality.

A four-ounce glass of dried beef with white sauce separated in a small cup is one of the newest canned meat items being launched by **Armour and Company.** This new product was announced by Esther Latzke while speaking at the Live Better Electrically Women's Conference sponsored by Edison Electrical Institute recently in Chicago.

Pillsbury Mills has announced the opening of their remodeled and reorganized Home Service Center in Minneapolis. Amidst the new ideas in facilities and staff assignments, a new emphasis on research stands out. **Mary Kimball,** long associated with the Pillsbury Mills research and development laboratories, is now with the Home Service Center with special responsibility for new products. In describing Miss Kimball's changed role, **Ruth Andre,** director of the Center, pointed out that it "represented a new company policy designed to keep the research and consumer points of view closely coordinated from test tube to grocery shelf."

A brass grille cabinet door which can be mounted on any size or style of cabinet is now available in **Wood-Mode Kitchens** featured by Wood-Metal Industries, Inc. The diamond pattern of the grille is subtly flattering to cherished show-off pieces and adapts itself equally well to both Wood-Mode Kitchen styles—Colonial and Contemporary.

According to a recent report by the **California Foods Research Institute,** California currently turns out more than 100 different kinds of canned foods and is responsible for nearly one-third of total U. S. canning production. Nearly every can of olives, peaches, apricots, figs, and fruit cocktail opened by the American housewife is grown and canned in California; and about half of the total U. S. fish, sweet cherry, pear, asparagus, and spinach pack originates there along with upwards of two-thirds of all the tomatoes and tomato products.

APPLICATION
FOR HOTEL ACCOMMODATIONS

49th ANNUAL MEETING

AMERICAN HOME ECONOMICS ASSOCIATION

PHILADELPHIA, PENNSYLVANIA

June 24–27, 1958

MAIL EARLY ***MAIL EARLY***

(List of Available Hotels on Back of this Page)

1. Reservation requests must be sent to the AHEA HOUSING BUREAU, Convention & Visitors Bureau, Penn Sq. Bldg., Philadelphia 7, Pennsylvania.
2. Please make all changes and cancellations through the HOUSING BUREAU.
3. Room assignments will be made in order received.
4. Single rooms are very limited. Your chances of securing accommodations at the hotel of your choice will be much better if your request calls for rooms to be occupied by two or more persons.
5. Be sure to list definite arrival and departure date and time.
6. Be sure to list all names of occupants of rooms.

AHEA HOUSING BUREAU
Convention & Visitors Bureau
Penn Sq. Bldg.
Philadelphia 7, Pennsylvania

Please check if you are attending a pre-convention session ☐

Specify name of group (HEIB or EXTENSION) _____

Please reserve hotel accommodations as follows:

1. **Preferred Hotels:**

First Choice _____ Fourth Choice _____
Second Choice _____ Fifth Choice _____
Third Choice _____ Sixth Choice _____

2. **Please specify the number and types of rooms desired:**

_____ Single room(s) with bath for _____ person(s). Rate $ _____ to $ _____ per room.
_____ Twin bedroom(s) with bath for _____ person(s). Rate $ _____ to $ _____ per room.
_____ Double bedroom(s) _____ persons. Rate $ _____ to $ _____ per room.
_____ Parlor bedroom suite _____ person(s). Rate $ _____

3. **Date of Arrival** _____ Hour _____ A.M. or _____ P.M.
(Reservations will be held **only** until 6:00 p. m. unless the hotel is notified otherwise.) (If, after making reservations, you find it impossible to attend please notify the AHEA Housing Bureau promptly.)

4. **Date of Departure** _____ Hour _____ A.M. or _____ P.M.

5. **If accommodations are to be used by more than one person please list names below:**

NAME	STREET ADDRESS	CITY	STATE

6. **BE SURE TO SIGN YOUR NAME** ➡ **Signed:** _____

(Company) _____

(Street Address) _____

(City and State) _____

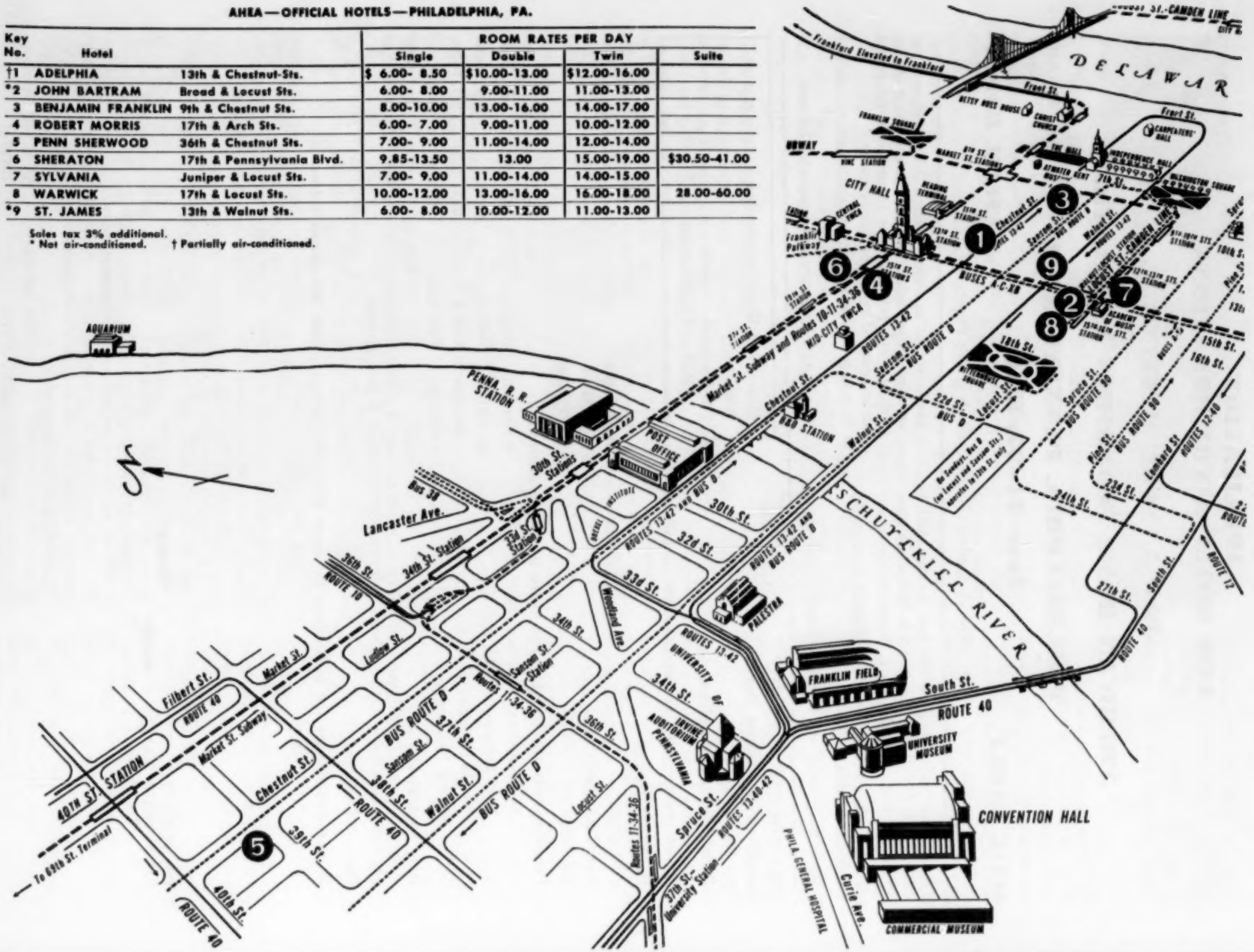
I am (please check) AHEA _____ EXHIBITOR _____

(over)

AHEA—OFFICIAL HOTELS—PHILADELPHIA, PA.

Key No.	Hotel		ROOM RATES PER DAY			
			Single	Double	Twin	Suite
†1	ADELPHIA	13th & Chestnut Sts.	$ 6.00- 8.50	$10.00-13.00	$12.00-16.00	
*2	JOHN BARTRAM	Broad & Locust Sts.	6.00- 8.00	9.00-11.00	11.00-13.00	
3	BENJAMIN FRANKLIN	9th & Chestnut Sts.	8.00-10.00	13.00-16.00	14.00-17.00	
4	ROBERT MORRIS	17th & Arch Sts.	6.00- 7.00	9.00-11.00	10.00-12.00	
5	PENN SHERWOOD	36th & Chestnut Sts.	7.00- 9.00	11.00-14.00	12.00-14.00	
6	SHERATON	17th & Pennsylvania Blvd.	9.85-13.50	13.00	15.00-19.00	$30.50-41.00
7	SYLVANIA	Juniper & Locust Sts.	7.00- 9.00	11.00-14.00	14.00-15.00	
8	WARWICK	17th & Locust Sts.	10.00-12.00	13.00-16.00	16.00-18.00	28.00-60.00
*9	ST. JAMES	13th & Walnut Sts.	6.00- 8.00	10.00-12.00	11.00-13.00	

Sales tax 3% additional.
* Not air-conditioned. † Partially air-conditioned.



VITAL LINK TO LIFE: FATS

SUPPLY

When accompanied by adequate amounts of all essential nutrients . . . fats play an important role in nutrition by furnishing a concentrated source of energy for carrying out daily activities.

These are percentages of total fat which Americans obtain from various foods . . .

43.2% from fats and oils (excluding butter) . . .

23.6% from eggs, meat, poultry and fish . . .

23.0% from milk in all forms, cheese, ice cream and butter . . .

2.7% from dry beans, peas, nuts and soya flour . . .

1.4% from flour and cereal products . . .

0.7% from vegetables and fruits . . . and

5.4% from other foods.

Of the calories consumed by Americans:

⅓ comes from animal food products (all dairy foods including butter, meat, poultry, fish and eggs) which supply: ¼ of our calcium; ⅔ of our riboflavin; about ⅔ of our protein; ½ of our niacin; ⅓ of our iron and thiamine; and ¼ of our vitamin A, chiefly preformed . . .

⅓ comes from plant food products (dry beans, peas, nuts, flour, cereal, fruits and vegetables) which supply: 9/10 of our ascorbic acid; almost ⅔ of our vitamin A and thiamine; about ½ of our iron and niacin; about ⅓ of our riboflavin; and ¼ of our calcium . . . and

⅓ comes from concentrated fat and carbohydrate foods (fats and oils, without butter, sugars and sirups) which provide less than 1/20 of any essential nutrient for which allowances are established.

Fat, as present in foods and used in meal preparation, contributes to the pleasure of eating . . . and to the body's fuel needs.

The nutritional statements made in this advertisement have been reviewed by the Council on Foods and Nutrition of the American Medical Association and found consistent with current authoritative medical opinion.

Since 1915 . . . promoting better health through nutrition research, education

NATIONAL DAIRY COUNCIL

A non-profit organization

111 NORTH CANAL STREET • CHICAGO 6, ILLINOIS

THIS ADVERTISEMENT IS ONE OF A SERIES. REPRINTS ARE AVAILABLE UPON REQUEST.

PRESS OF
JUDD & DETWEILER, INC.
WASHINGTON, D. C.

Here, Sara Hervey Watts is shown in her attractively appointed colonial kitchen. She's preparing to serve Weight Watchers' Lemon Pudding, one of many interesting low-calorie dishes you can make with calorie-free Sucaryl.

University Microfilms
Attn: Mr. Stevens Rice
313 North First Street
Ann Arbor, Michigan

Sucaryl® recipe for March

from the Kitchen of Sara Hervey Watts, Home Economics Consultant, Abbott Laboratories

Picture this taste-tempting dessert on *your* table! Its fresh, tangy flavor and fluffy lightness make it a perfect prelude to spring. This lemon pudding is as sweet and satisfying as the richest dessert, yet it saves all sugar's calories. Imagine—only 58 calories in each serving when you sweeten it with Sucaryl, compared to 203 calories when it's sweetened with sugar. *And you can't taste the difference!*

Weight Watchers' Lemon Pudding with Rhubarb Sauce

- 1 envelope gelatin
- ½ c. cold water
- 3 eggs, separated
- 1 tbsp. Sucaryl solution
- ⅓ c. lemon juice
- 1 tsp. lemon rind
- ¼ c. nonfat dry milk solids
- ¼ c. ice water
- 3 c. diced rhubarb
- ⅓ c. water
- 1 tbsp. Sucaryl solution
- 2 tsp. cornstarch

Sprinkle gelatin over cold water; let stand 5 min. Beat egg yolks; add 1 tbsp. Sucaryl, lemon rind, juice; cook in top of double boiler until mixture thickens. Add softened gelatin; stir until dissolved. Remove from heat; cool until slightly thickened. Beat egg whites to soft peaks; fold into gelatin. Combine dry milk solids, ice water; beat to texture of whipped cream; fold into gelatin. Pour into 8 individual molds or a 1-qt. mold (slightly oiled). Chill. Serves 8. Rhubarb Sauce: Combine rhubarb, water, 1 tbsp. Sucaryl. Cook on low heat until rhubarb is soft; mash with fork. Add some to cornstarch for paste; return to rhubarb in saucepan. Cook rhubarb in saucepan until thick. Cool and serve on pudding.

FREE! Calorie-saving recipes with Sucaryl

32 pages of wonderful, kitchen-tested low-calorie recipes by Sara Hervey Watts. A treasure for everyone who is sensibly cutting calories! Clear, easy-to-follow instructions and color illustrations make it an invaluable teaching aid for home economics classes.

Available at your drug store, or write ABBOTT LABORATORIES, NORTH CHICAGO, ILL. for ample quantities of this book, plus free SUCARYL samples, for your classroom use.

ABBOTT LABORATORIES • NORTH CHICAGO, ILLINOIS

® Sucaryl—*Non-Caloric Sweetener, Abbott*